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PRINCIPLES AND PRACTICE
OF
ORAL SURGERY

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BY

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AFFECTIONATELY DEDICATED

TO MY

MOTHER

PREFACE

In writing this book on "The Principles and Practice of Oral Surgery" I had two view points constantly in mind. (1) To try to produce a work that would be sufficiently elementary for the undergraduate. Therefore, definitions, synonyms, as well as other helpful data are included for his benefit. (2) For the practitioner, for whom detailed technic and step-by-step illustrations were especially prepared.

All extraneous matter—not strictly Oral Surgical subjects—such as Bacteriology, Micropathology, etc., have been purposely omitted as they are of interest to the laboratory student, consequently are more fittingly described elsewhere.

For lack of *clear* illustrations many texts often fail to convey the author's technic and intentions. How well this has been corrected in this volume is left to the judgment of the reader.

I, here, express my sincere gratefulness to Dr. Truman W. Brophy—the acknowledged dean of the world's oral surgeons, not only for the privilege of having worked with him in his clinics, but for the Foreword he prepared for this volume.

To Dr. Thos. P. Hinman—a man of ideas and ideals—who first kindled my interest in Oral Surgery and whose interest has since never waned, I am truly grateful.

To Mr. Francis Deck who made most of the illustrations I am indebted, also to P. Blakiston's Son & Co. for their cooperation in producing the finished volume.

I am obligated to Dr. L. Pierce Anthony for his friendly advice, and am thankful to Dr. H. M. Boon, my associate, for his valuable aid in sorting the illustrations and for reading of the proof. My

thanks are likewise tendered to my head office nurse, Mrs. O. H. Jones, R. N., for her assistance with the proof; also to my secretary —Miss McElroy—for the typrewriting of the manuscript.

S. L. Silverman.

Atlanta, Ga.

CONTENTS

CHAPTER I

	Page
Dento-Alveolar Abscesses	1–8
Chronic Dento-Alveolar Abscess, 8.	

CHAPTER II

Necrosis	9–16
Periostitis-Osteomyelitis, 15.	

CHAPTER III

Other Diseases of Bone	17–22
Syphilis, 17; Tuberculosis of the Jaws, 18; Leontiasis Ossea, 19; Actinomycosis, 20.	

CHAPTER IV

Stomatitis	23–37
Leukoplakia Buccalis, 23; Herpes Labialis, 23; Perleche, 24; Noma (Cancrum Oris), 26; Scurvy, 27; Foot and Mouth Disease, 27; Scleroma, 27; Vincent's Stomatitis (Trench Mouth), 28; Ludwig's Angina, 28; Adenitis and Cellulitis, 29; Periodontoclasis (Pyorrhea Alveolaris), 33.	

CHAPTER V

Maxillary Sinusitis	38–48

CHAPTER VI

Benign Tumors of the Jaws	49–54
Epulis, 49; Fibroma, 52; Osteoma, 53; Other Benign Growths, 54.	

CHAPTER VII

Malignant Tumors of the Jaws	55–62
Sarcoma, 55; Carcinoma (Cancer), 58.	

CHAPTER VIII

Resection of the Jaws	63–76
Resection of Mandible, 68.	

CHAPTER IX

Resections of the Tongue (Glossectomy or Elinguation)	77–83
Kocher's Technic for Total Excision of the Tongue, 79; Malformations and Diseases of the Tongue, 82; Ankyloglossia (Tongue-Tie), 82; Macroglossia, 82; Black Tongue or Hairy Tongue, 82; Injuries of the Tongue, 83; Geographic Tongue, 83; Glossodynia, 83.	

CHAPTER X

Diseases of the Salivary Glands	84–89
Mumps (Parotitis), 84; Retention Cysts, 84; Ranula, 84; Salivary Fistula, 89.	

CHAPTER XI

Cysts of the Jaws	90–100

CHAPTER XII

Dislocation (Luxation) of Mandible	101–111
Subluxation of the Mandible, 103; Ankylosis (Trismus), 103.	

CHAPTER XIII

PAGE

Fracture of the Jaws 112–153
Fractures of the Mandible, 113; Fractures of the Maxillae, 139; Fractures of the Malar Bone, 145; Delayed Union, 148; Head Bandages, 149.

CHAPTER XIV

Trigeminal Neuralgia 154–167
Neurectomy, 161; Avulsion of the Mandibular Nerve, 163; Avulsion of the Lingual Nerve, 166.

CHAPTER XV

Removal of Broken Needles 168–171

CHAPTER XVI

Bell's Palsy (Bell's Paralysis) 172–174

CHAPTER XVII

Irregularities of the Teeth and Jaws 175–178

CHAPTER XVIII

Plastic Surgery 179–186
Esser's Epithelial Inlay, 184.

CHAPTER XIX

Maxillo-Facial Prosthesis 187–194

CHAPTER XX

Alveolectomy 195–201

CHAPTER XXI

Pericementoma 202–207
Apicoectomy, 203.

CHAPTER XXII

Reimplantation of Teeth 208–209

CHAPTER XXIII

Hemorrhage 210–219
Hemophilia (Hemorrhagic Diathesis), 212.

CHAPTER XXIV

Impacted Teeth (Malposed Teeth) 220–243
Removal of Mandibular Third Molars, 229; Removal of Maxillary Third Molars, 234; Removal of Maxillary Cuspids, 235.

CHAPTER XXV

Cleft Lip 244–274
Operations for Cleft Lip, 254; Operations for Double Cleft Lip, 262.

CHAPTER XXVI

Cleft Palate 275–306
Atresia Palati, 303; Palate Obturators, 306.

CHAPTER XXVII

The Training of Speech After Cleft Palate Operations 307–322

Index 323–326

FOREWORD

In 1839, when those earnest workers in the interests of humanity, Drs. Chapin A. Harris and Horace H. Hayden, attempted to incorporate in the curriculum of a medical college of Baltimore a department of dental and oral surgery, they met with opposition on the part of the medical faculty. The only course open for them to pursue was to establish an independent institution in which the maladies of the mouth and associated parts, many of which had their origin in the teeth, might be taken up by men well informed upon these subjects and by classes of students who might have the opportunity to acquire the knowledge necessary to engage in such practice. From that small beginning, today forty-six American universities have well equipped departments of dental surgery with a large corps of teachers in each whose instruction covers the whole domain of the diseases and injuries of the mouth and associated parts, together with the general principles of pathology and surgery, et cetera.

The few text books in use at the time mentioned hardly exceeded a half dozen. They have been increasing from time to time until now they are legion. The first book that gained the attention of the profession was written by Dr. Chapin A. Harris, "Principles and Practice of Dental Surgery." Later appeared "A System of Oral Surgery," by that great philosopher, that matchless teacher and master of oral surgery, Prof. James E. Garretson. This was the first book to appear on that subject. It was carried along into the 5th edition, when the life work of that remarkable man came to an end. Since then many other authors have produced books, and there is still room for others.

In many of the excellent books on general surgery that have come out in recent years, the authors have not given space to the diseases and injuries of the oral cavity, nor have they scientifically considered those diseases which have their origin in the mouth and often manifest themselves in parts remote. This condition is accounted for by the fact that the authors themselves never had opportunity as students to acquire a knowledge of these conditions.

In 1915, a survey of sixty-four of the leading medical colleges of this country revealed that only six of the sixty-four had chairs of oral surgery. The sad results of such a lack of education in these lines are seen in the medical and surgical tragedies in the treatment of diseases and malformations occurring in the oral cavity. So long as the majority of medical colleges utterly fail to teach their students oral surgery, just so long will the principles underlying the subject be misunderstood and, as in the past, there will continue to be innumerable failures in operations and treatment in this field.

The author of a text book assumes a great and solemn responsibility. Every patient who is operated on by a surgeon whose knowledge of treating his case was acquired by reading a text book which is not sound in its teaching; which advocates for instance, the excision of the premaxillary bones with the consequent permanent mutilation of the patient, may well place the responsibility of this procedure at the door of the author.

To write a book on surgery, no matter what special field the author discusses, requires a great deal of courage, for he is then set up as a target for criticism. That criticism may come from honest, earnest workers in a kindly spirit, from men who are desirous of building up instead of tearing down, and is indeed helpful to the author in revising his work; it may come from men who, for want of a knowledge of the subjects criticized, do it in such a way that it is obviously unworthy of consideration. Any book which will contribute to the general information on

the subjects included under the heading of Oral Surgery, is a benefaction.

The profession at large is indebted to Doctor Silverman for his careful presentation of the subject. I feel certain that the author's desire has been to present material that could be relied upon to assist practitioners and students in the care of their patients.

TRUMAN W. BROPHY.

INTRODUCTION

Oral Surgery deals with the management of the surgical diseases, injuries and malformations of the mouth, jaws and associate parts.

This branch has been fortunate indeed in that it has received the attention of some of the best minds engaged in two professions—Medicine and Dentistry. Without this combined aid it is doubtful whether the present state would have been attained in the short time of its existence as a recognized specialty.

These two sources, upon which Oral Surgery is builded, have contributed much to the literature. Among the recent outstanding American contributors the following are mentioned: Babcock, Berger, Blair, Blum, Brophy, Brown, Cryer, Davis, Dorrance, Dunning, Eastman, Federspeil, Gilmer, Harrison, Hinman, Ivy, Kazanjian, Loeb, Logan, Lucas, Lyons, MacMillan, McCurdy, McGee, Miner, Moorehead, New, Potts, Rasmussen, Roberts, Schamberg, Shearer, Scudder, Tholen, Thoma, George Winter and Leo Winter.

Among the French, the works of Hayes, Lemerle, Martinier, Morestin, Pont and Villain have been of great value.

In Germany, the literature has been enriched by Esser, Hauptmeyer, Partsch, Perthes, Schröder, Williger, Witzell and others. Pichler of Austria is also to be mentioned.

The British Empire has furnished, among others, the following internationally known writers: Berry, Gillies, Lane, Legg, Pickerell, Owen and Risdon.

The question has often arisen as to who is best qualified to practice Oral Surgery and I hope that what follows will help to

clarify and settle the subject: Some contend that only those holding the M.D. degree should practice Oral Surgery. Others contend that the holder of a D.D.S. degree is the only one capable of intelligently practicing this branch. Finally, there are those that contend that one must have both the M.D. and the D.D.S. degree in order to be proficient. Personally, I am of the opinion that he who is best qualified, irrespective of what degrees he has received, should practice Oral Surgery. In this country there are many examples that bear out my contention. Blair of St. Louis has only the M.D. degree but has qualified in dental pathology so well as to become one of the best Oral Surgeons. On the other hand, Lyons of Ann Arbor, Professor of Oral Surgery at the University of Michigan, has only a dental degree but qualified in general surgery and pathology to such a degree that he too is now one of our leading Oral Surgeons.

In my own locality there are men who hold both degrees but, being preoccupied with other branches of their choice, refer their Oral Surgery to me. In short, the degree itself is not a criterion. *Special preparation* is necessary in order to become proficient. No one would consult a surgeon whose time is preoccupied in orthopedic surgery in a case requiring a caesarean section, and yet both the orthopedic surgeon and the gynecologist have identical degrees.

S. L. Silverman.

PRINCIPLES AND PRACTICE OF ORAL SURGERY

CHAPTER I

DENTO-ALVEOLAR ABSCESSES

Definition.—An abscess occurring at the apex of the root of a tooth, usually resulting from an infection following the death of the pulp.

The two types of dento-alveolar abscesses—acute and chronic—are more common in the lower than in the upper jaw. This observation applies only to the more diffuse and complicated abscesses and is not to be confounded with the typical uncomplicated abscesses where a fistula has been established either by the burrowing pus or by an intra-oral incision. This comparatively minor type is more fittingly described in works on operative dentistry to which the interested reader is referred. Here, I will only consider the graver form in which, following the escape of pus from the alveolus, the soft tissues begin to swell to prodigious proportions, often closing the eye by the resulting edema of the lids when the offending tooth is in the upper jaw; if in the lower jaw the swelling may even protrude the tongue, particularly if the abscess is pointing lingually. If injudiciously poulticed the abscess may point anywhere on the face or along the lower border of the mandible, thus producing a very disfiguring scar. Delay in proper treatment may cause an alarming and persistent rise of temperature, excruciating pains, malaise, and the endangering of the surrounding teeth and bone and even the life of the patient.

Symptoms.—The symptoms are nearly always unmistakable and the history usually will corroborate them. Briefly, the patient will give a history of a tooth becoming sore to percussion and a small amount of swelling or, in a case of a vital tooth, such as an erupting lower third molar, the surrounding tissue only will become sore and swollen but the tooth itself will rarely be sore to percussion. This is designated as a *periodontal* abscess. The pain becomes more severe until the pus finally escapes into the soft tissues. As is well known, pus will point and burrow in the direction of least resistance and having once passed through the bone it may take a rather unexpected course, or courses. Not infrequently dento-alveolar abscesses in the maxillae will point into the antrum, on the outside of the cheek, through the tuberosity into the pharynx, less frequently into the orbit and nose. In the mandible, fistulae may be seen opening under the chin, at the angle, or as low as the clavicle, and even as far down as the middle of the sternum. Once pus has made its exit the painful and alarming symptoms will subside, but as long as it is confined the tissues will continue to swell. Oftentimes the pus burrows between the bundles of muscle fibers and also between the periosteum and the bone into which it may make several ramifications which not infrequently results in necrosis. The temperature during this period may rise to 103°F. and in some cases I have seen it 108°F. In neglected cases these very high temperatures are not at all infrequent, and death comes as a boon to the patient who has endured days of most excruciating torment.

Treatment.—Uncomplicated dento-alveolar abscesses, as already stated, do not belong to this discussion therefore will not be considered here. The advanced type, however, needs our careful attention. There appears to be several views regarding the proper treatment of the advanced type of acute dento-alveolar abscess. The question is often asked whether extraction is a safe and proper procedure. My experience shows beyond a doubt that

extraction is absolutely indicated and safe; *providing the pent up pus is seen to escape and drain following the removal of the offending tooth.* In most cases of advanced dento-alveolar abscesses the tooth is only remotely connected, in as much as the burrowing pus has carried the disease to distant points. Failing to see pus follow in the wake of an extraction, an incision 2½ cm. in length is made in the most pendent portion of the swelling, whether that be within or without the mouth. Extra-oral incisions should be made in the shadow of the jaw so as to hide the scars. The knife can be safely sunk 4 to 5 mm. along any portion of the mandible intra- or extra-orally and, if the pus lies deeper, it is to be reached by inserting closed hemostatic forceps, tunnelling in first one then another direction until the discharge is started. The forceps, while still in place, are opened as shown in Fig. 1. No injury to blood vessels or nerves is to be feared if this technic is adhered to even when making incisions extra-orally in the region of the facial artery. The abscessed nidus being thus stretched, a small piece of rubber dam is rolled up and nicked with a pair of scissors (Fig. 2) so as to give it a barbed effect for retentive purposes. It is never necessary to make extra-oral incisions for draining abscesses of the maxillae, it matters not how extensive the infection may be, it can be reached by an intra-oral incision about 2½ cm. in length at the reflexion of the mucous membrane. If the incision, which is 5 or 6 mm. deep, fails to reach the pus, the closed hemostatic forceps are inserted until the discharge is started, and then widely opened (Fig. 3) so as to insure a free avenue for drainage. The drain, whether it be of rubber dam, as here advocated, or rubber tubing, iodoform gauze, or other material, must be carried to the bottom of the wound. In extra-oral incisions a dressing of gauze held in place by adhesive tape or bandage is recommended. In some cases the drain may be discontinued in three or four days, but it is much safer to allow it to remain about a week or ten days. Every forty-eight hours the drain should be pulled out about 3 mm.,

FIG. 1.—After making the incision, the closed hemostats are inserted to the bottom of the wound and then opened.

FIG. 2.—A piece of rolled and nicked rubber dam is inserted and is self retaining.

so as to allow resolution to proceed and also prevent "sticking." It will be seen that drainage and not extraction *per se* is the object.

Another mooted question is the advisability of curetment in acute cases and, while I find some textbooks which favor it, I

FIG. 3.—The hemostats are inserted through an incision under the lip, and are then opened until the discharge is started.

cannot but look with dismay upon the practice. I firmly believe that an exacerbation of symptoms may follow such a procedure, and the least that may be said of the practice is that it is superflu-

ous. Oftentimes, following the extraction of an acutely abscessed tooth, particularly in young children whose dentitions are incomplete, the symptoms, rather than subsiding, flare up, the infection

FIG. 4.—Sequestrum of right side of mandible.

becoming worse, and culminating in necrosis of a considerable portion of the jaw (Fig. 4). It is then that the dentist or physician is blamed with infecting the patient. This imputation is without basis, therefore is unfair, and I quite agree with Blair that, even if

unclean forceps have been employed, the beaks can never reach the part that is usually the seat of necrosis. I have on several occasions given utterance in open court to this effect where legal suits have followed unfortunate extracting sequelae. Early drainage will prevent much of the pain and discomfort and in nearly all cases, external incisions will not be necessary. Should a neglected mandibular case, however, make its appearance, extra-oral incisions can rarely be avoided. Nitrous oxide and oxygen or ether are the anesthetics of choice in this operation. The use of local anesthetics in diffuse acute cases is both ineffective and likely to spread the infection. If drainage has been complete, the patient will awaken with much abated symptoms and grateful for the relief. Proper elimination during the illness is imperative. A liquid diet of varied order is sufficient for the patient and drinking of water is to be urged. Where the patient is unable to take liquids by mouth, retention enemas as indicated in Ludwig's Angina (which see) is to be instituted.

CHRONIC DENTO-ALVEOLAR ABSCESS

When the active symptoms of an acute dento-alveolar abscess have subsided, particularly in cases where drainage was belated, the path made by the pus often leaves a necrotic area in its wake, or a sequestrum may form. Treatment for this condition will be considered in the chapter on Necrosis. The so-called blind abscess or periapical abscess is best treated by ionization or apico-ectomy (see page 203).

CHAPTER II

NECROSIS

Definition.—The death of a circumscribed portion of tissue, surrounded by living tissue.

Necrosis is a result of some kind of an infection or irritation rather than a disease in itself. Of the many causes capable of producing necrosis of bone, the following are the most frequently encountered: Dento-alveolar abscess, periostitis, eruptive fevers particularly in children, ulcerative stomatitis, syphilis and tuberculosis. Among the minerals, mercury, lead, arsenic and phosphorus are especially capable of producing extensive destruction of bone. The term Necrosis is applied to death of bone *en masse*, while *caries* of bone refers to a molecular disintegration of bone. *Gangrene* is used to designate death of soft tissues. In a broad sense necrosis and gangrene imply death of tissue as a result of checked or strangulated blood circulation. The mandible is more frequently the site of necrosis than are the maxillae due, no doubt, to the difference in the blood supply. The outstanding difference between necrosis and caries of bone rests not alone in the macroscopic and microscopic appearance, but in the treatment indicated for each.

Symptoms.—The earliest local symptoms of necrosis are pain, fetid odor of breath characteristic of dead bone, pus discharging within the mouth or pointing extra-orally, and deranged digestion. Upon being probed through an existing fistula or between the gums and loosened teeth, the bone gives forth a harsh, grating sound. The roentgenogram is of utmost value to complete the examination (Fig. 5). As the process of necrosis continues it finally results in the loosening or detaching of the dead bone,

which can, in most cases, be detected by manipulating the affected part. This process is known as *sequestration*, and the detached part is referred to as the *sequestrum* (Fig. 6).

Fig. 5.—Necrosis of left mandible (Roentgenogram by C. O. Simpson).

Treatment.—In order to obviate the spread of the destructive process of necrosis, the treatment is rather one of non-interference except opening any abscess that may appear. The accumulated

FIG. 6.—Sequestrum of right side of mandible, following necrosis.

pus must be given a free avenue of escape and drainage must be established. No attempt should be made to remove any bone until the sequestration is complete. To do so may result in the spread of the infection. An incision through the most pendent portion, whether it be intra- or extra-orally, is made and a drain (see Fig. 1) is inserted. This will at once be quite a relief to the patient and will help to minimize the destruction of the bone as well as hasten the formation of the sequestrum. At the same time it should be ascertained if there exists any specific cause. If any of the metallic poisons are to blame, such as mercury, arsenic, lead or phosphorus, they must be stopped. The source must be removed. Where syphilis or tuberculosis have resulted in necrosis of the jaw, the patient must receive constitutional treatment for these diseases as indicated in textbooks dealing with the particular subject. The local treatment as indicated above can, however, go hand in hand with the constitutional treatment. Whatever the cause of necrosis, the treatment in a general way is the same. It will be found that in the average case where necrosis has destroyed a small or large portion of the bone, nature will regenerate the lost portion. In fact, as the sequestrum begins to form, a new bone formation known as the *involucrum* makes its appearance. When the dead bone is removed a layer of granulating tissue is found separating the sequestrum from the involucrum. Under no circumstances should these granulations be curetted. I have seen the entire body of the mandible regenerate after the removal of the sequestrum (Figs. 7 and 8). Necrosis of the upper jaw is rarely very extensive, but when encountered, the treatment is not unlike that described above. After the removal of a sequestrum, the wound is to be kept irrigated with a bland solution and dressed every forty-eight hours with 5% iodoform gauze. This is continued until the wound becomes shallow enough, if intra-oral; or if extra-oral until the granulations do not permit entrance of the drain. As indicated in all diseases, proper alimentary elimination must

Fig. 7.—Loss of practically entire body of mandible following periostitis and necrosis.

FIG. 8.—Same as Fig. 7 after bone regeneration.

accompany the treatment. Where the destruction is extensive and the general condition grave, nutritive retention enemas are of utmost value.

PERIOSTITIS—OSTEOMYELITIS

Definition.—Periostitis denotes inflammation of the periosteum, while Osteomyelitis refers to inflammation of the marrow of the bone or both bone and marrow.

The periosteum is a fibrous membrane which invests or covers the external surfaces of the bones, except at the articular surfaces and at the points of insertion of tendons and ligaments. It is composed of two layers—an outer or fibrous, and an inner or osteogenetic. The periosteum serves to give attachment to the surrounding tissues and as a means of nourishment, growth, and regeneration of bone (Marshall). Periostitis may be acute or chronic. If the former, it may be a simple local condition or diffuse and infective in character. The termination of acute periostitis may be by resolution or suppuration and necrosis.

Symptoms.—The periosteum being raised or stripped from the bone, the pain and swelling becomes very marked. As pus forms, the skin will pit on pressure. Among the prominent causes, the following may be mentioned; difficult eruption of the teeth particularly of the permanent set, injuries, mercurial or phosphorous poisoning, as well as any of the eruptive fevers that leave the patient with a lowered resistance.

Treatment.—As soon as pus is located or even suspected, an incision from within the mouth (if at all feasible) is made. The wound is drained and a 3½% iodine solution is instilled until the wound is full. This is then washed out with 95% alcohol and a rubber drain is inserted (see Figs. 1, 2 and 3). This treatment will minimize the amount of necrosis. Where treatment is instituted rather late, the *diffuse* type of periostitis will set in, and culminate in the loss of a considerable portion of the jaw.

Osteomyelitis differs from *periostitis* mainly in that the original infection in the former is nearer the central portion of the bone, but in the evolution of the disease it comes up to the periosteum, thus involving this structure. The treatment for osteomyelitis of the jaws is identical with that of periostitis.

CHAPTER III

OTHER DISEASES OF BONE

SYPHILIS

Definition.—A chronic infectious, and contagious, venereal disease which is sometimes hereditary. It is characterized by cutaneous lesions, mucous patches, and gummata, and is caused by the Spirochaeta pallida (Treponema pallidum).

FIG. 9.—Perforation of hard palate as a result of tertiary syphilis.

Since the treatment for the primary and secondary lesions of syphilis belong to the domain of the urologist and dermatologist, it will not be considered here. The tertiary stage must receive our attention, as it seems to have a predilection for the bones of the face and upper jaw. Syphilitic necrosis of the lower jaw is rare. The center of the dome of the hard palate is the most common

point of attack for syphilis (Fig. 9). The nasal septum and the bridge of the nose are next in line (Fig. 10).

Symptoms.—The symptoms of syphilitic necrosis are not unlike other forms of necrosis, and only the history and laboratory findings can differentiate one from the other. Syphilitic necrosis differs from most other forms in that the sequestra are usually smaller. The destruction of bone may be great, but rarely do the sequestra involve more than the vomer or premaxillary bone.

Fig. 10.—Same as Fig. 9 showing loss of bridge of the nose.

Treatment.—The treatment for tertiary syphilis of the jaws is the same as for any other portion of the body. The sequestra are not to be removed until the patient has had a fair course of constitutional treatment. Mouthwashes and drainage, however, should go hand in hand with the constitutional treatment.

TUBERCULOSIS OF THE JAWS

While tuberculosis of the jaws is very rare, it will occasionally be met with in the larger clinics. It can usually be differentially

diagnosed from actinomycosis or sarcoma by examining the discharge. It is usually secondary to pulmonary tuberculosis. The glandular involvement is greater in tuberculosis than in syphilis and is not noticeable at all in sarcoma.

Treatment.—The treatment differs from that for syphilitic necrosis in that the operation should be done at the earliest possible moment. Nutritious food, open air and other recognized tubercular treatments are of course indispensable.

FIG. 11.—Leontiasis Ossea (Scudder, "Tumors of the Jaw," Copyright W. B. Saunders Company).

LEONTIASIS OSSEA

Definition.—A diffuse hyperostosis of the maxillae and upper bones of the face and cranium.

Leontiasis ossea differs from a simple local hyperostosis in that it is bilateral and symmetrical. The cause is obscure, but Virchow believes that it may be the result of an inflammatory process. The involved bones hypertrophy to a great extent and in advanced cases the thickened bone increases in weight to five times the normal (see Fig. 11). Kanavel points out the difference between Leontiasis Ossea and *Acromegaly* as lying chiefly in the fact that the former shows almost an obliteration of the diploe, while the latter shows almost a normal relation to the cortical bone. Leontiasis Ossea usually starts at the anterior nasal spine of the maxillae and slowly involves the facial and frontal bones.

Treatment.—The treatment is very unsatisfactory and is only instituted to relieve symptoms as they arise. The growth of bone around the eye often bulges it out of its socket, and resection of the jaw in the region will often give relief. The hard palate, when affected, grows downward so that the vault is quite even with or below the alveolar process. The removal of this portion of the affected parts is rarely satisfactory. If the growth is unilateral, removal is easy and the results good. Most observers, however, doubt if leontiasis ossea is present when only one side is affected.

ACTINOMYCOSIS

Definition.—An infectious disease affecting cattle and man. Also known as "lumpy jaw" and "clyers."

It is caused by a parasitic organism known as *ray fungus*, which is usually found in grain and straw. Farmers, hostlers and millers, who are in the habit of holding straws or blades of grass in their mouths, or of eating raw grain, are especially subject to this infection.

In the early stages diagnosis is not easy, as the swelling in the region of the angle of the jaw and neck often resembles an immense tumor. In certain parts of the United States this disease is more prevalent—the western states offering more cases than those in

the east and south. I have seen only two cases in the clinics of Atlanta, both patients having been brought from the country. As the disease advances, a sinus, or as is more often the case, sinuses form. The presence of *ray fungi*, which is very easily identified, absolutely determines the diagnosis. The external appearance of the affected part resembles tubercular affections of the neck (Fig.

FIG. 12.—Actinomycosis (Marshall, "Injuries and Surgical Diseases of the Face").

12). Sulphur granules are to be looked for in the secretion as the ray fungus is usually found in these granules.

Prognosis and Treatment.—Murphy expresses the belief that actinomycosis of the various parts of the body is about 60% fatal. As we are particularly interested in actinomycosis of the jaw and associated parts, it is gratifying to learn that in these regions, if the disease has not progressed too far, the cures are 70%. The

treatment indicated is immediate surgery. An incision, sufficiently long to allow a liberal retraction, is made well below the angle. All the granulating tissue is removed with knife or cautery. This applies to the soft tissue; the bone can be removed with curet and chisel. A close inspection should be made daily to keep any new spread under control. The dressings of iodoform gauze are to be continued until a healthy, firm, granulating surface appears. After this they may be discontinued and the edges sutured. The general condition of the patient should receive the recognized treatment as indicated in all grave diseases. It is claimed by some that potassium iodide in usual doses has a beneficial effect.

CHAPTER IV

STOMATITIS

Definition.—Inflammation of the mouth.

Simple stomatitis and catarrhal stomatitis (since these occur chiefly in infants) are subjects really in the realm of the pediatrician, and the oral surgeon rarely sees patients so afflicted. Suffice it to say that constitutional treatment plus weak solutions of boric acid or zinc sulphate will usually effect a cure.

The same may be said of *Apthous* stomatitis, except that this may occur in children and even in adults. This affection is characterized by white patches and is often called *Thrush*.

Alimentary elimination and a boric acid mouthwash is indicated for infants and children. In obstinate cases 2% silver nitrate should be applied.

Ulcerative stomatitis is much the more serious of the mouth infections and may be a form of Vincent's infection. It is characterized by a loosening of the gums from the necks of the teeth. The margins of the gums become very painful, and bleeding is very much in evidence. There is a fetid breath and a slight elevation of temperature. The prognosis is good.

Treatment.—Consists of a balanced diet, the constant use of an active rather than a bland mouthwash and alimentary elimination. The pain may become very severe; in such cases a local application of cocaine (2%) or morphine hypodermically should be tried.

LEUKOPLAKIA BUCCALIS

Definition.—A disease of the tongue and mucous membranes of the mouth characterized by the formation of white patches. This disease is also known as *Psoriasis Linguae*, "smokers patch,"

Leucoma Leucokeratosis, etc. It is extremely rare and its etiology is unsettled. Some claim that syphilis is responsible, others that hot foods, smoking and irritating condiments are the exciting causes. On the other hand, leukoplakia buccalis has been noticed in cases where none of the above could be demonstrated or admitted. It is safe practice, however, to advise against the use of tobacco and other irritants at least until the disease is eradicated.

The roentgen ray is of great value in the treatment of leukoplakia and as a prophylactic measure should be tried, rather than endanger the patient by allowing the condition to become malignant. Caustics have no place in the treatment of leukoplakia. Butlin says, "One general rule holds good for all cases, namely; not to use caustics. Whatever danger there may be of the development of carcinoma it is certainly increased by the employment of nitrate of silver and other caustics." Radical surgery is the best treatment for all cases that are at all of the advanced type.

HERPES LABIALIS

Definition.—An acute inflammatory disease characterized by the development of small vesicles in clusters on an inflamed base. These vesicles are commonly called *fever blisters* or *cold sores*.

The causes named as responsible are innumerable and unsatisfactory, but I agree with Blair that "regardless of the cause, herpes of the face and mouth seems to be a trophoneurosis of the fifth nerve." Herpes of the lips, unlike herpes of the mouth, is rarely painful and with the correction of the alimentary condition plus the application of campho-phenique the disease soon disappears. Herpes of the mouth may need the application of 2% silver nitrate or chromic acid.

PERLÈCHE

Definition.—A disease of the lips of children, contagious in character, and of bacterial origin.

Symptoms.—Perlèche is confined to the corners of the mouth and is characterized by deep cracks or fissures. The disease derives its name from the fact that the affected patient is seen to

FIG. 13.—Noma. Twenty-four hours following this photograph the contents of the orbit also succumbed to the destructive process.

lick the fissured and burning corners of the mouth. The age of the patient and the location of the sore will differentiate the condition from the primary lesion of syphilis. Unlike syphilis, healing takes place without leaving radiating scars.

Treatment.—The treatment consists of applying strong antiseptics, such as the tincture of iodine, painting the solution well into the fissures.

NOMA (CANCRUM ORIS)

Definition.—A spreading, ulcerative condition of the mucous membrane of the mouth, especially in young children.

FIG. 14.—Result of radical excision for incipient noma.

Nothing is known about the etiology except that it usually attacks children who have been much debilitated by such diseases as measles, typhoid and diphtheria. The initial lesion, as a rule, starts at the labio- or bucco-gingival fold and rapidly progresses until the lips and cheeks are entirely destroyed. The teeth drop out, the upper and lower jaws are exposed, and reveal a necrosed mass of putrid material. The contents of the orbit become

involved in this horrible devastation (Fig. 13). Strange to say the patient is often conscious and in good spirits up to the point of death. If the case is taken in hand early, a radical excision into the healthy tissues followed by the application of strong antiseptics, such as 10% formalin plus methylene blue, will, at times, arrest the disease. Figure 14 shows just such result. A plastic operation was refused by the parents of the boy.

SCURVY

Definition.—Scurvy is a disease resulting from the lack of food for a length of time—specifically—from the lack of a sufficient quantity of the anti-scorbutic vitamin in the diet for a prolonged length of time.

The mouth symptoms are spongy, bleeding gums, loosening of the teeth and fetor of the breath. The disease is now practically unheard of excepting with exploring parties who disregard the question of diet. Correction of the diet plus the use of an active mouthwash reinforced by fresh air and rest is conducive to a cure. Loose teeth should be splinted, as then they soon tighten.

FOOT AND MOUTH DISEASE

Definition.—An infectious disease affecting cattle and man.

It is transmitted both by the milk of infected cows and by contact. Blair says, "Small vesicles form in the lips, gums and tongue, seldom on the pharynx or palate. Haubner advises painting the separate vesicles with a 3% solution of carbolic acid, using a camel's hair brush from which the solution should not drip. The general care of the patient should receive careful attention, for the disease is often fatal."

SCLEROMA

Definition.—Circumscribed induration of granulation tissue in the mucous membrane or skin.

Symptoms.—The symptoms are at first rather difficult to differentiate from any other swelling about the mouth. The swelling,

at first soft, eventually becomes hardened. When the inner surface of the cheek is affected it has an undulated, shrunken appearance, the mucous membrane shrinking to such an extent as to cause fibrous ankylosis. The soft palate is less often affected; the contraction in this region will pull the tongue upward and interfere with speech.

Treatment.—The treatment consists of operations designed to relieve the contraction and is described in the chapter on Fiprous Ankylosis.

VINCENT'S STOMATITIS (TRENCH MOUTH)

Definition.—An ulcerative condition of the mucous membranes of the mouth, caused by the Bacillus fusiformis and Vincent's spirochete.

The symptoms of Vincent's stomatitis (incorrectly called Vincent's angina) are chiefly characterized by painful, bleeding gum margins. A grayish membrane is to be seen at the gum margin which, when wiped off, soon forms again. One outstanding clinical picture is the disappearance of the crest of the septal gum.

Treatment.—Various authors advocate different treatments. Phenol, chromic and trichloracetic acids, as well as other escharotics have been recommended. Methylene blue and 10% formalin have also been recommended. The writer prefers the latter, supplementing it with peroxide of hydrogen as a mouthwash. A balanced diet and alimentary cleansing is also advised. The writer strongly advises against extraction of teeth or curetment of infected areas, or even oral prophylactic treatments during the acute stage.

LUDWIG'S ANGINA

Definition.—A "board like" swelling of the floor of the mouth, usually associated with infected teeth, mandible, and submaxillary glands.

Symptoms.—In Ludwig's angina the chief manifestation is the hard swelling underneath the mandible. As the infection spreads, the patient finds deglutition very painful. The tongue being forced to the roof of the mouth, breathing becomes very difficult. The patient assumes a sitting posture to facilitate breathing. In neglected cases, fatal termination is the rule.

Tracheotomy has saved some neglected cases.

Treatment.—If treatment is instituted early, the prognosis is very good. I am opposed to intra-oral incisions for the treatment of this grave disorder. A median incision, extending from the symphysis almost to the hyoid bone, bearing heroically down on the knife until the fascia is passed, is the first step. With a closed hemostat, a tunnel is made toward both submaxillary glands and then opened widely. Considerable pus will be found, and under great pressure. After the evacuation of the pus, a few drops of iodine are placed into the wound, followed by the filling of the wound with grain alcohol. The alcohol is then sponged out and a piece of rubber-dam drain (Fig. 15) is inserted into both submaxillary regions. No attempt is made to suture, as the wound heals with but little scar (Fig. 16) and to suture might defeat the desired drainage. In the course of ten to fourteen days the wound will have ceased to discharge and the two drainage rolls, which have been pulled out about 5 mm. every forty-eight hours, can now be entirely removed. Owing to the extreme discomfort of the patient, due to inability to take food by mouth, and to the difficulty of respiration, proctoclysis is especially indicated in this disease. Particular attention is called to the fact that both submaxillary regions should be reached and drains inserted into both.

ADENITIS AND CELLULITIS

Definition.—While adenitis refers to inflammation of a gland—more specifically of lymphatic glands—cellulitis refers to an infection along tissue planes, but as a rule the tissue planes and the

FIG. 15.—Shows author's method of drainage in Ludwig's Angina.

Fig. 16.—Scar, following operation for Ludwig's Angina.

FIG. 17.—Principal points for incisions for the relief of a suppurating condition of the neck; *a*, incision and drainage of submaxillary region; *b*, high cervical incision and drainage; *c*, lower cervical incision and drainage; *d*, supraclavicular incision and drainage of the neck.

lymphatic system are both involved. In mild cases cold applications are recommended to the affected part in order to abort the infection. Free incision and drainage are indicated for all advanced cases (Fig. 17) and the general management for these conditions is not unlike the treatment for Ludwig's Angina.

PERIODONTOCLASIA (PYORRHEA ALVEOLARIS)

Definition.—The breaking down of the tissues surrounding the root of a tooth.

The technic for operating for this condition is given here, but it is not to be understood that the author recommends this for any cases excepting those that the periodontist feels would benefit by it. The less formidable procedures employed by the periodontist are certainly to be preferred but in aggravated cases I am of the opinion that the open operation is, as a last resort, the only procedure capable of bringing results. If the operation about to be bescribed fails, extraction of the teeth involved is the only recourse.

Only two incisions are made for any given area (Fig. 18). With a periosteal elevator, the soft tissues are raised from the bone. The roots of the teeth, the interdental spaces and the pockets are all open to view (Fig. 19). After removing all concretions and curetting the granulating tissues (Fig. 20) the flap is returned to its place and sutured (Fig. 21). Only one suture in the interproximal space should be used for an area involving six teeth or less, as these locations are far from being clean.

Fig. 18.—Following the two vertical incisions the festooned gum tissue is raised with a dull instrument.

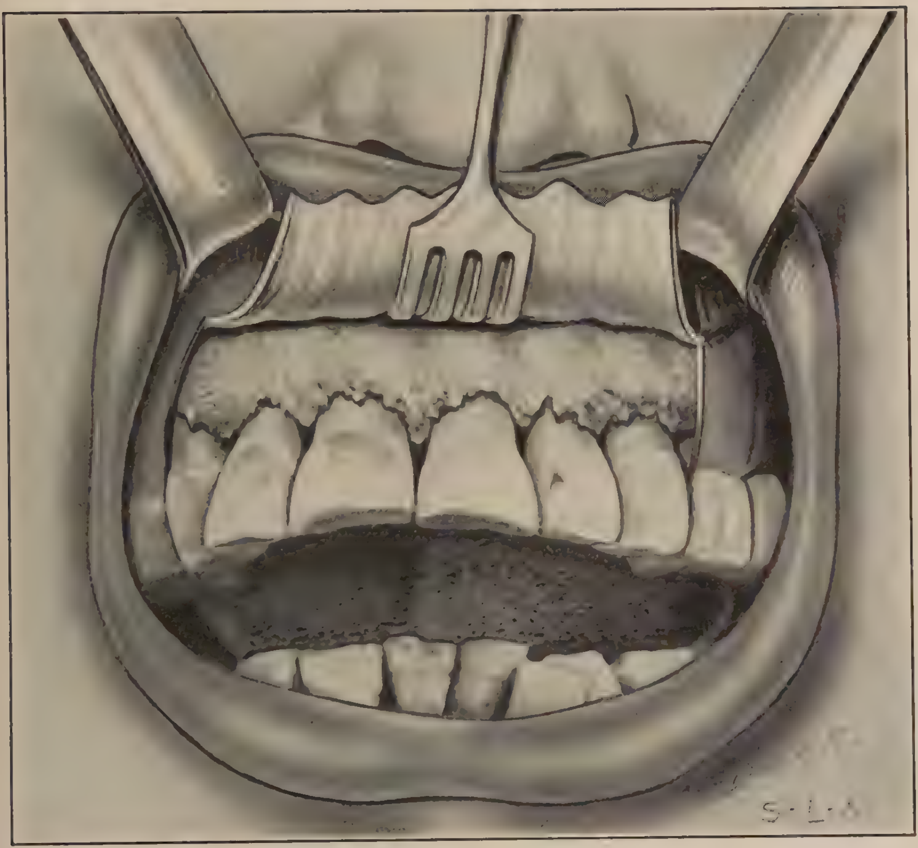


FIG. 19.—The jagged alveoli are exposed to view.

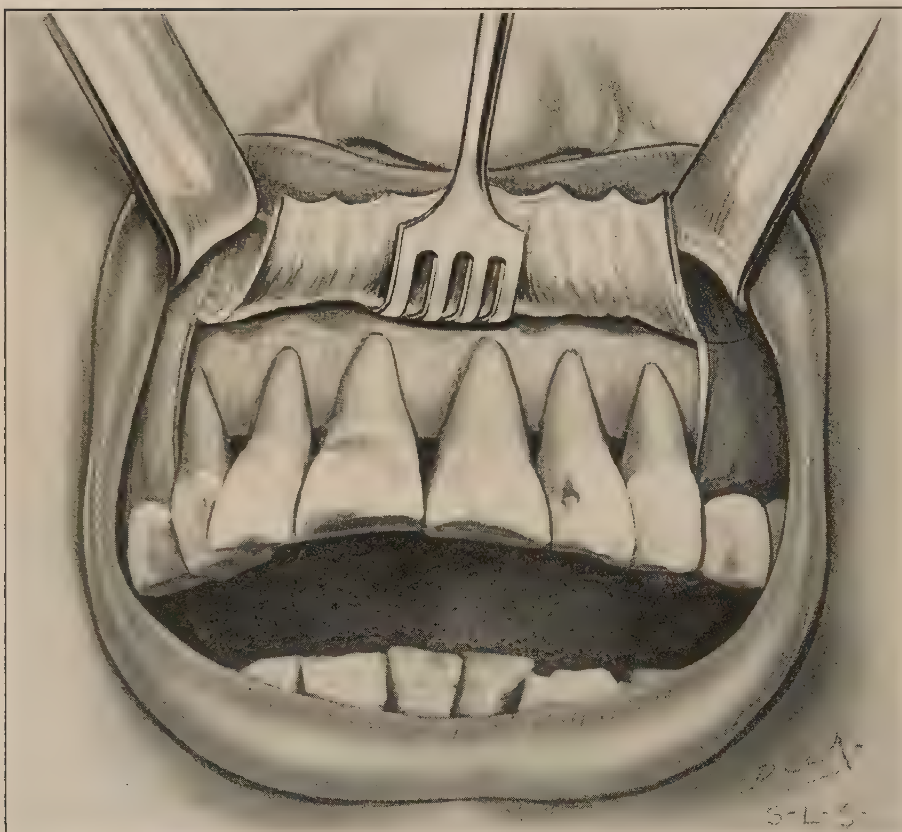


FIG. 20.—Same as Fig. 19 after all diseased tissue has been removed.

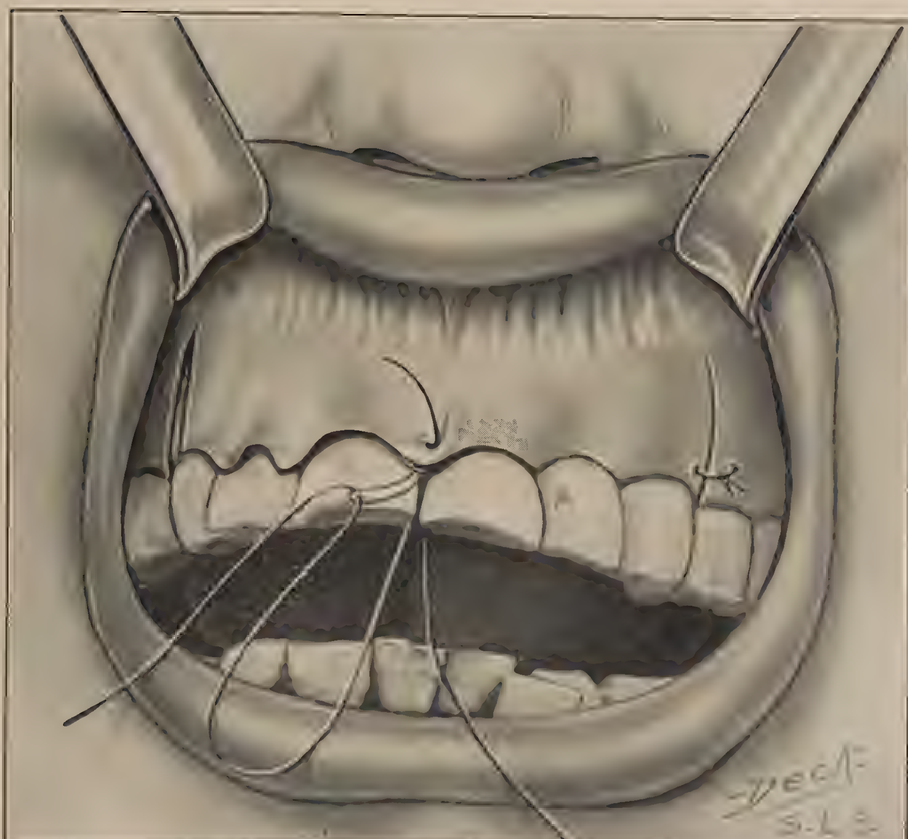


Fig. 21.—Flap returned and only 3 sutures are inserted.

CHAPTER V

MAXILLARY SINUSITIS

Definition.—An infection of the antrum of Highmore.

Due to the close proximity of the maxillary sinus to the teeth, nose and frontal sinus, infection often follows disorders affecting these associated parts. Nasal infections, frontal sinusitis, ethmoiditis and influenza are often the cause of antral infection, and in such cases the treatment is certainly in the realm of the rhinologist. Dental abscesses, periodontoclasia and injuries to the maxillary bones also produce a great percentage of antral infections.

The symptoms of maxillary sinusitis in the acute stage are characterized by pain in the affected area, a sense of bulging and a discharge of pus through the nostril of the affected side. The discharge of pus, however, may be observed to come through the root canals of a carious tooth, by the side of the roots of a tooth affected with periodontoclasia and through the socket of an extracted tooth. In rare cases I have seen the pus burrow through the lateral wall and discharge through the lower eyelid or cheek, or through the posterior surface of the maxillary tuberosity. If the disease is only of a few days standing, irrigating the antrum either by a nasal puncture or by an intra-oral puncture just above the root apices of the teeth will often bring about resolution. The irrigating solution may be any one of the accepted antiseptics, such as mercurochrome or other weak agents.

It is not always an easy matter to make a positive diagnosis, especially in the chronic form of maxillary sinusitis. The methods of diagnosis usually employed consist of transillumination and antero-posterior roentgenograms of the head. No reliance is to be placed on dental film examinations, as they are totally unfit

FIG. 22.—X, infected right antrum.

for antral diagnosis. Transillumination is accomplished by remaining with the patient in a dark room for about three minutes, so as to effectively dilate the pupils of the examiner's eyes. A small electric lamp, especially designed for this purpose, is then placed in the patient's mouth and held against the roof. In most cases the affected side will appear very much darker and more opaque than the normal side. This is due to the infected and engorged antrum offering more resistance to the illumination. The roentgen ray, however, offers the best means for diagnosis, and the record of it is permanently depicted on the large film (Fig. 22). Differential diagnosis is at times necessary to exclude tumors or cysts of the maxillary sinuses. The history will often help to determine any doubt that may exist. Aspirating the antrum will also differentiate a cystic fluid (which is odorless) from the ordinary chronically infected antrum. In cysts of the antrum the lateral or buccal wall will often be bulged and will give forth a crackling sound, not unlike a faint crepitus, when pressed with the palm of the hand. The invasion of the growth into the surrounding tissues plus other pertinent history will at once arouse suspicion of malignancy.

Treatment.—The diagnosis being made of a chronic maxillary sinusitis, the operator has the choice of either approaching the antrum by removing the inner or nasal wall (intra-nasally) or by removing the outer or buccal wall (intra-orally). Results in this as in other efforts are what we desire but personally I agree with Dr. Brophy that the intra-nasal approach permanently leaves a large opening between nose and antrum, even though the infection has been eradicated. The intra-oral approach not only eradicates the disease but the opening between the mouth and antrum is obliterated. Dr. Brophy says: "Every surgical operation should be made with a view to leaving the parts in as nearly a normal anatomical position as possible . . . Nature created an aperture of communication, the osteum maxillare, between the nose and the antrum.

It is the surgeon's duty, in case this natural opening has been closed by adhesions as the result of inflammation, to open it and re-establish its function instead of making a large, unnatural opening at the base of the nose through which dust and mucus may enter the antrum, thus becoming a constant irritant and making the permanent cure of the disease impossible. Nasal mucus will enter

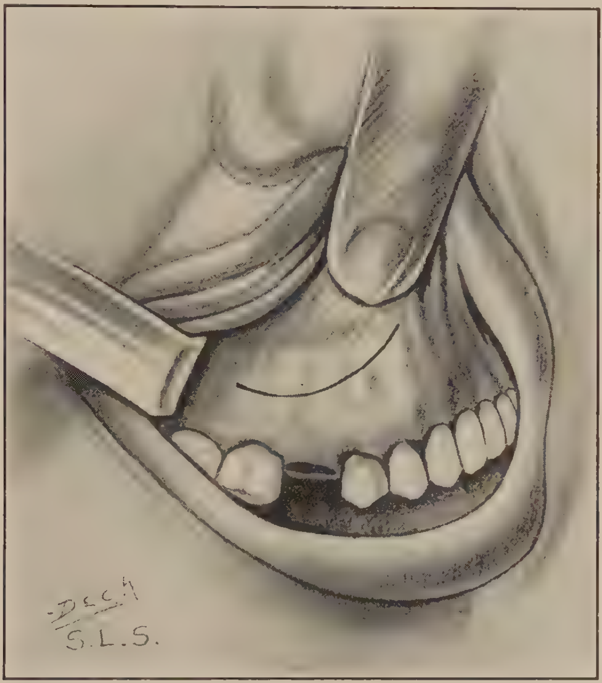


FIG. 23.—Incision for radical operation for chronic maxillary sinusitis.

these large openings, become encrusted, and cannot be removed except with the greatest difficulty."

Lastly, the intra-nasal approach does not allow a satisfactory ocular or digital examination, and in this respect is certainly inferior to the intra-oral approach, which at once allows the operator to inspect all walls of the antrum. The recovery of a small foreign body in the antrum can be accomplished easily, only by the intra-oral method. The technic of the operation consists of making an incision above the apices of the teeth. This incision should

extend from the region of the cuspid to that of the third molar (Fig. 23). A periosteal elevator easily lifts the soft tissues from the bone. With a chisel and mallet a window is cut so as to permit the entrance of the index finger and while the assistant retracts the lip and cheek, the operator removes the polypi, which almost invariably are found in chronic antral infections. With a proper

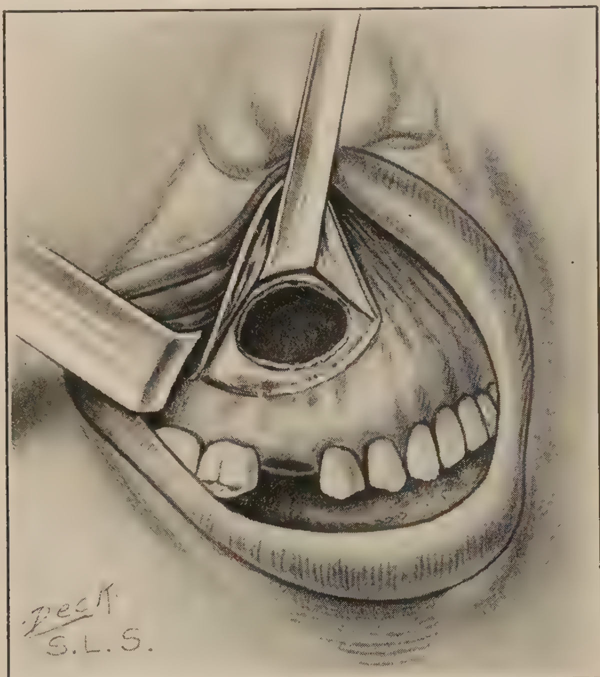


FIG. 24.—Sufficient bone has been removed to permit entrance of index finger.

light he is able to see practically every part of the antrum, and with the palpating finger as an adjunct, the area can hardly habor any extraneous matter (Fig. 24). After the antrum has been thoroughly cleaned out and inspected, a rather snug iodoform-gauze dressing is inserted with the end protruding from the line of incision.

This first dressing should fill the antrum entirely in order to control hemorrhage, particularly in the unconscious patient. All subsequent dressings (changed every forty-eight hours) are very

loosely placed and are intended for two purposes, namely, to prevent premature healing of the lips of the wound, and to "wick" out the secretions of the antrum. These subsequent dressings are to be made very much smaller as the treatment progresses, — about 4 cm. long and 12 mm. wide. In most cases of chronic maxillary sinusitis the dressings should be continued from two to

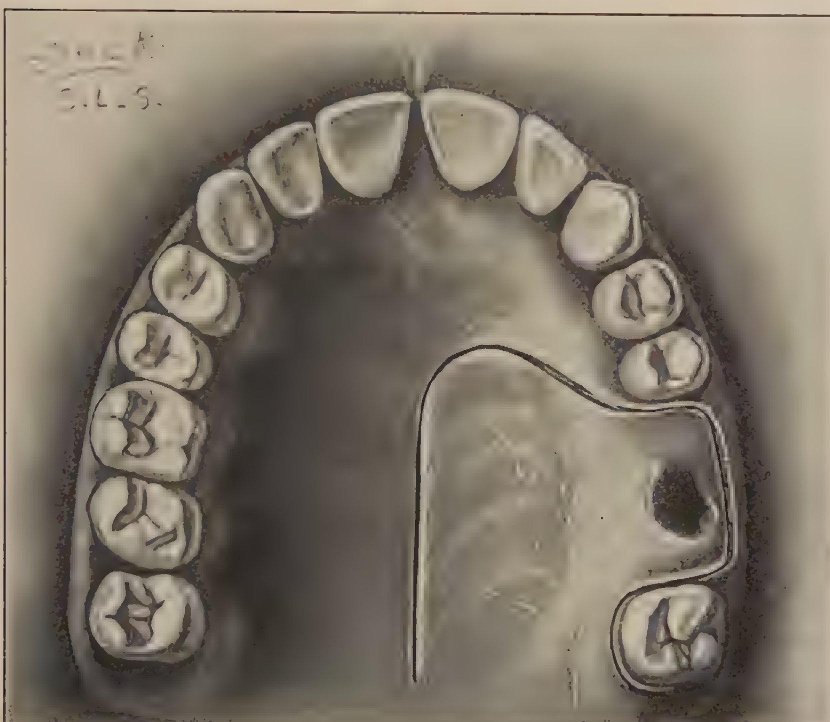


FIG. 25.—Incision preserves anterior palatine artery (Modified from Dunning).

three weeks, depending on the appearance of the returned irrigating solution. Oftentimes a troublesome serumal discharge persists and in those cases a 2% zinc sulphate solution used as an irrigant will correct the discharge in two or three treatments. Rarely will the wound have to be sutured, as within two or three months the healing will be complete. If the incision is made too low, the opening will usually need surgical closing. Improper

dressings in the after treatment are also conducive to non-healing of the wound. By an "improper" dressing is meant, too bulky a plug which keeps the lumen of the wound stretched. The dressing should be flat, more of a wick-shape, and should be teased towards the anterior rather than towards the posterior portion of the incision.

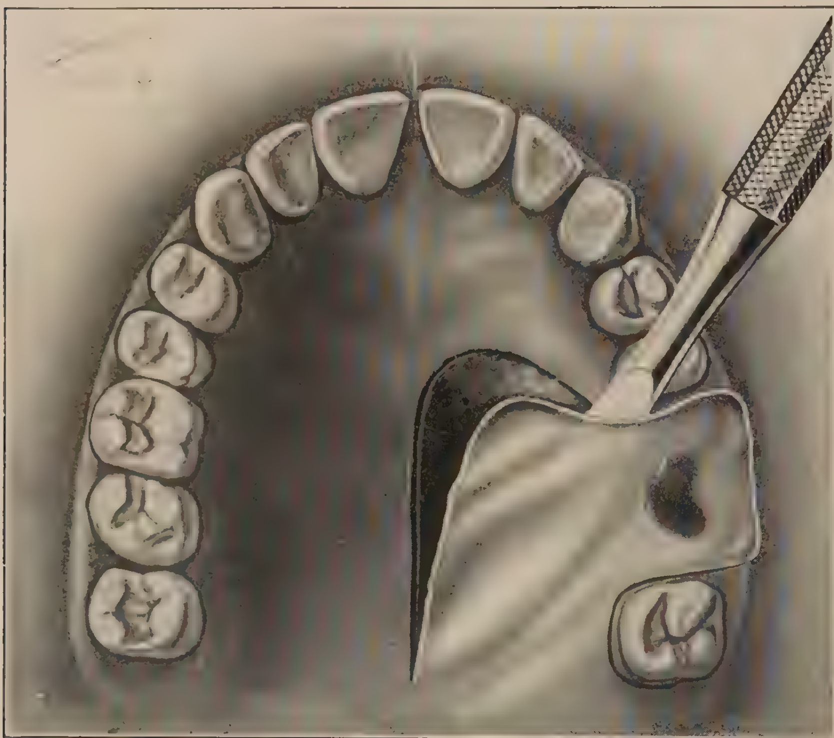


FIG. 26.—Periosteal elevator lifts the mucoperiosteum from the bony palate.

It will be noted that only two methods for radical operation on the antrum have been mentioned. There are other operations recommended that embrace the two above mentioned. Thus, the Caldwell-Luc operation is accomplished by invading the antrum both intra-nasally and intra-buccally, but the latter opening is immediately sutured and the drain inserted through the nose. All subsequent treatments are also through the nose. The

Denker operation consists of an incision from the median line and extending to about the first molar; the soft tissues including the periosteum are elevated and the antrum is entered through the canine fossa. All of the bone lying between the antrum and the opening of the nose is then removed. The drainage in this operation as in the Caldwell-Luc is also through the nose. Some writers

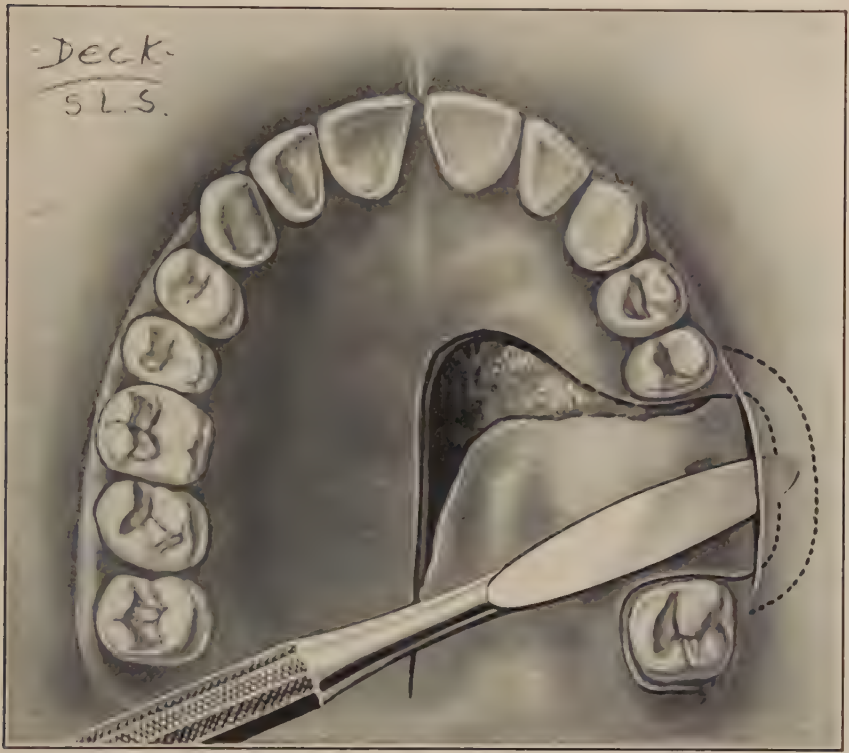


Fig. 27.—End of flap insinuated under buccal mucoperiosteum.

advocate openings through the tooth sockets, but in the large number of cases that I have observed, I have yet to see this operation prove successful in chronic maxillary sinusitis. The reason for this, I believe, is obvious, and may be attributed to the fact that socket openings are too small to permit of visual or digital examination, and do not allow curetment of the inaccessible surfaces that mark the antrum. This approach often results in permanent openings

requiring surgical closure as illustrated in Figs. 25, 26, 27 and 28. Figure 29 shows the relation that the sinuses bear to each other.

FIG. 28.—Stitches holding flap in place. Exposed portion of bone needs no especial attention (Modified from Dunning).

Figure 30 shows the relation of the antrum to the nose. Arrow shows natural drainage into nose.

FIG. 29.—The floor of the antrum is lower than the floor of the nose. The buccal route for antral entrance seems to be in accordance with the anatomical topography.

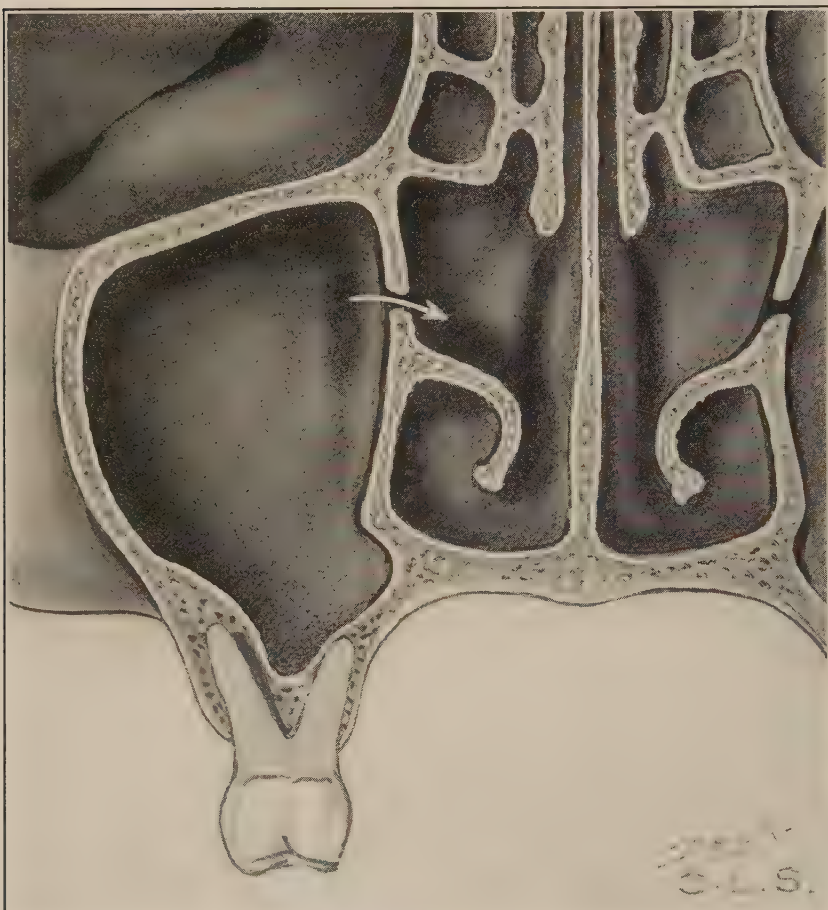


Fig. 30.—This and Fig. 29 further shows that the buccal antral entrance is the one of choice.

CHAPTER VI

BENIGN TUMORS OF THE JAWS

Definition.—A benign or non-malignant tumor is a growth having a limiting membrane. It does not invade the surrounding tissues or neighboring glands and will not recur if effectively removed. A benign growth does not metastasize.

EPULIS

Definition.—A benign tumor, apparently arising from the gums but in reality arising from the periosteum or periodontal membrane.

The symptoms are mainly a slow growing, pedunculated tumor, found near jagged teeth or chronic gum infections. An epulis may be firm and of a pink hue, or it may have a purplish color and easily bleeds upon touch. This latter type has been designated as a fibro-angioma. Although these tumors are capable of growing to large dimensions, they are, as a rule, not larger than a walnut (Fig. 31). Aside from discomfort in eating, they are rarely ever painful. Children and young adults are very much more affected than people of middle age; in the aged epulis is quite unknown. Being benign in character, the prognosis is very good, providing that the base of the tumor along with the affected periosteum, bone or teeth involved, are thoroughly removed. Shaving or clipping off the growth and application of escharotics are not only fruitless, but at times, may stimulate the growth into an unmanageable malignancy.

The treatment consists of making an incision 5 mm. into the healthy tissues and with a small saw or surgical bur cutting out a section, carrying with it all the growth and cause (Fig. 32). Chisels may also be used, and after filing smooth the exposed bone,

FIG. 31.—Epulis in anterior portion of right maxilla (Modified from Perthes).

FIG. [illegible].—Partial resection of mandible. No regard is taken of the mandibular canal.

a dressing of iodine-creosote or glycerine and tannin preparation may be applied. The after-treatment consists of keeping the mouth frequently rinsed with a bland mouthwash.

FIBROMA

Definition.—A tumor made up of fibrous tissue.

An epulis is in reality a fibroma, but the latter term is used to designate growths that are of a very large size (Fig. 33) and those

Fig. 33.—Fibroma of cheek which was removed intra-orally (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

that particularly involve both sides of the median line (Fig 34). Fibromata are very slow in their growth and there are no symptoms except those following the pressure exerted on the surrounding tissues. Being of benign order, it is not necessary to resect the entire jaw, but as Perthes has suggested, a healthy border of bone,

particularly in the mandible, is to be preserved so that the symmetry of the region can be maintained. Fibromata, like other benign tumors, do not invade the tissues, but may destroy them by pressure atrophy.

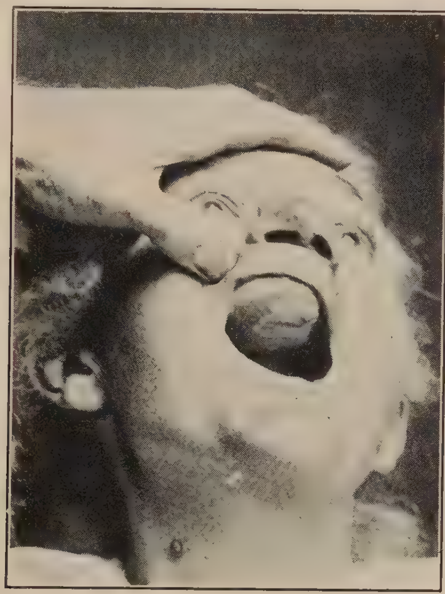


FIG. 34.—Fibroma of the right side of the palate finally involving the entire palate (J. L. Campbell).

OSTEOMA

Definition.—An osteoma is a tumor composed of bone and oftentimes is not to be differentiated from hypertrophy of bone (Fig. 35). Osteomata may originate from bone, periosteum or cartilage. When other tissues are mixed with bone in the formation of a tumor they are called by their compound names, such as osteo-fibroma, osteo-chondroma, etc. Needless to say an osteoma is a very hard tumor and requires much effort to chisel away. Very little of the underlying jaw need be removed. No difficulty need be experienced in making differential diagnosis between a cyst and an osteoma as the roentgenogram will very readily decide.

OTHER BENIGN GROWTHS

Now follows a brief mention of tumors likely to occur in the jaws, but the treatment outlined for epulis, will suffice in all cases of benignancy.

Lipoma, a fatty tumor and exceedingly rare.

Chondroma, a tumor composed of cartilage.

Myxoma, a tumor made up of mucous tissues and having a flattened appearance.

FIG. 35.—Large osteoma of the right side of mandible (Scudder, "Tumors of the Jaw," Copyright W. B. Saunders Company).

Composite odontoma is a tumor made up of dentin, enamel and cementum. This form of tumor is of course the densest and hardest of all tumors and once exposed (usually lying within the jaw bone) the diagnosis is settled. The technic for the removal of an odontoma is not unlike that for removing any unerupted or impacted tooth. The only difference being their respective sizes. Enameloma, Dentinoma and Cementoma are self-explanatory and very rare.

CHAPTER VII

MALIGNANT TUMORS OF THE JAWS

Sarcoma.—A malignant growth originating in the marrow of bone or periosteum and other connective tissues.

Sarcomata are often referred to as osteo-sarcomata due to the fact that they originate more often from the structure of the bone. They are designated histologically as giant-cell sarcoma

FIG. 36.—Osteochondromyxosarcoma of the maxillae. Patient recovered following complete excision (Scudder, "Tumors of the Jaw," Copyright W. B. Saunders Company).

(least malignant), spindle-cell sarcoma (next in malignancy), and round-cell sarcoma (most malignant). The prefix fibro, chondro, myxo, osteo, lympho, angio, appearing before the term "sarcoma" denotes that that sarcoma is composed of large amounts of fibrous, cartilaginous, myxomatous (mucous) bony, etc. tissue in combination with the sarcomatous tissue. These mixed types of sarcomata are midway in malignancy between benign and true sarcomatous tumors (Figs. 36 and 37).

Melanosarcoma refers to a pigmented sarcoma and is a very malignant type.

Symptoms.—In the early stages sarcoma may be confused with any other growth about the jaws, and a microscopical examination is the only means of obtaining definite information. Dentists and physicians who minimize the necessity of dealing carefully with any suspicious incipient growth often regret their course. Care should be taken with any growth that may arise, particularly

Fig. 37.—Osteochondromyxosarcoma with cystic degeneration.

in young adults, and adults in the forties. Unlike carcinoma (cancer) the sarcomata are usually of slow appearance; glandular involvement is late, if at all, and ulceration occurs late in the disease. The subjective symptoms are, as a rule, pains in the affected region, due to the nerves in the field becoming involved.

Halitosis is usually very marked. Sarcomata when occurring in the upper jaw may bulge the palate and interfere with breathing on the affected side. The alveolar processes of both jaws are more often the starting points of sarcomata than are the bodies of these bones and, therefore, any persistent alveolar periostitis should be looked upon with suspicion.

Prognosis.—The prognosis in early cases of sarcoma may be considered as fair, but in the later stages the termination is usually fatal. Scudder says: "The earlier after its appearance a sarcoma is operated upon, the better, because the time that has elapsed since the appearance of the growth is short, does not necessarily mean that the operation will be successful. A most malignant type of the disease may grow rapidly and be so far advanced that even though it is relatively an apparently early operation, it is really too late. It is, of course, true that the earlier the diagnosis is made and the earlier the operation is done, the greater is the likelihood of curing this malignant local growth."

Treatment.—The surgical treatment of sarcoma of the jaws depends upon the stage of the disease, its exact location, the kind of cells composing it, and the general condition of the patient. An operation in advanced cases of round-cell sarcoma involving a large portion of the upper or lower jaw, with infiltrations into surrounding tissues, is rewarded with a fatal termination. Thus, surgery of the mouth in such cases, receives credit for a mortality through an operation that should never have been attempted. Radium and the therapeutic uses of the roentgen ray, plus opiates, should constitute all that ought to be done in these grave cases. The procedure indicated in *giant-cell* sarcoma, where little of the bone is involved, and particularly where the alveolar ridge is the seat, *is one of conservation.* The section removed should contain a good margin of healthy tissues (see Fig. 32) leaving the lower border to later form new bone, or be the seat for an artificial appliance. In the more malignant types, such as the *spindle-cell* and *round-cell* sarcomata, the operation should consist of *complete resection* of the bones involved. As the glands of the neck are rarely affected in sarcoma, I see no reason for dissecting them. If at all palpable they should of course be removed. Sarcoma differs from carcinoma in this respect: in carcinoma we have an early involvement of the lymphatics and a tendency to metastasis, consequently block

dissection of the neck is absolutely imperative. In sarcoma, on the other hand, there is usually an early *local* recurrence, but rarely metastasis or glandular involvement. The use of the roentgen ray following operations on sarcomata of the jaws and associate parts is recommended. (See chapter on Resection of the Jaws.)

CARCINOMA (CANCER)

Definition.—A malignant tumor made up of epithelial cells which tend to infiltrate and give rise to metastasis.

Carcinoma of the jaws is more frequently seen than is sarcoma. Of course, carcinoma proper is a disease of epithelial tissues, but the invasion soon extends into the neighboring connective tissues. *Epithelioma* is used by some authors to designate superficial carcinomata of the skin and mucous membrane. Carcinoma is a disease found in patients past middle life, usually between the ages of fifty to eighty years. It is much more frequent in the male than in the female. (It must be remembered that this applies to oral carcinomata.) It occurs more frequently in the lower than in the upper lip, and the upper jaw is less often the site of carcinoma than the lower jaw. Carcinoma of the lips and cheek is often seen in smokers and tobacco chewers. This in part explains the ratio noticed in carcinoma in the two sexes. It is also a fact (whether or not concomitant I cannot state) that decayed roots of teeth, ill-fitting bridges and artificial dentures are nearly always present.

Symptoms.—Neuralgic pains of a dull nature with a sense of pressure are often the only subjective symptoms. Carcinoma of the antrum may cause a bulging of the lateral wall. Oftentimes the patient will insist on the extraction of teeth in order to get relief. *When several teeth are found to be loose in a bulging area in a patient past the age of forty, the condition should receive the careful examination* one would give a suspicious area. The growths have almost a typical appearance once they have advanced sufficiently (Fig. 38).

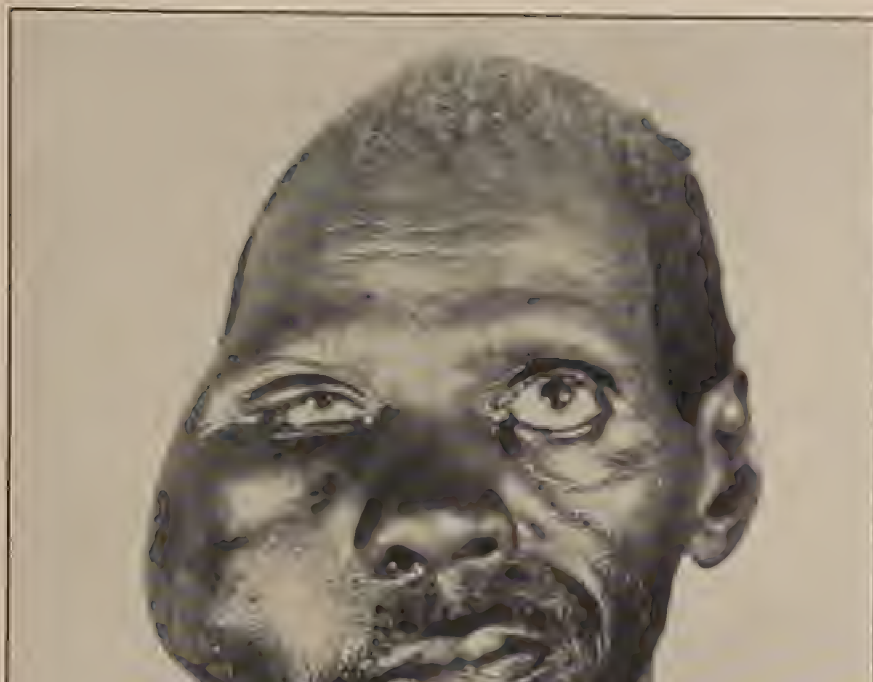


FIG. 38.—Inoperable carcinoma of the right side.

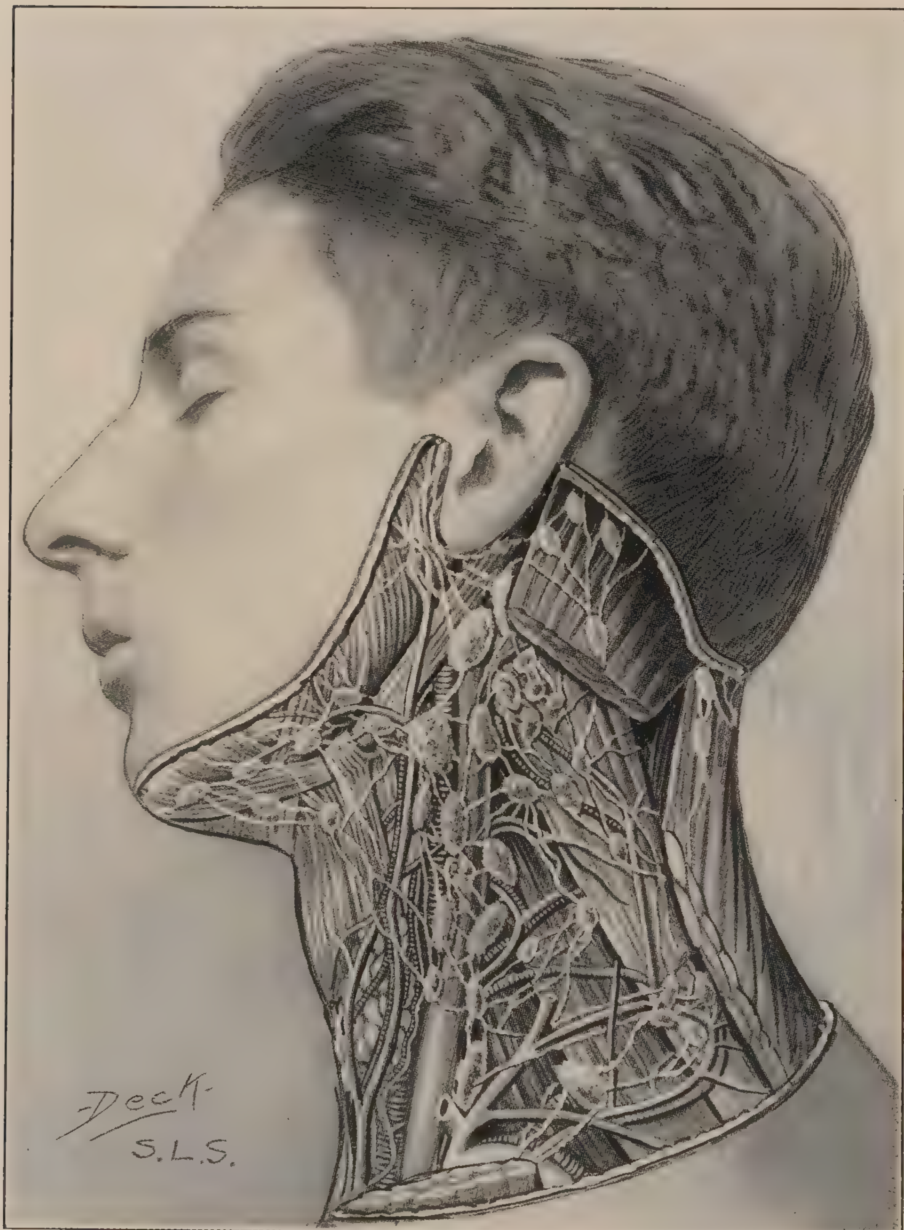


FIG. 39.—Dissection of the neck showing the relation of the lymphatic system to the vessels and muscles of this region.

Prognosis.—The prognosis of carcinoma, at best, is bad. Since diagnosis in the early stages is very difficult the disease in the average case has infiltrated into the lymphatics and as a consequence even radical surgery, including block dissection of the neck, can only prolong the patient's life a very few months. Figure 39 shows the abundant lymphatic system of the region. In the

FIG. 40.—Metastasis following an epithelioma of the lip. Inoperable (J. L. Campbell).

unoperated upon carcinomata of the mouth, the patient, according to most authorities, dies in from one to two years. Radical excision should be done as a palliative measure if the disease is not too extensive. Where metastasis has occurred in the neighborhood or at some remote point, surgery is not indicated (Fig. 40).

Treatment.—The treatment in carcinoma should at no time be conservative. Total resection of the jaw, although not a cure, at least prolongs the life of the patient, whereas, partial resection

will almost invariably incite the growth to excessive proliferation, thus making the patient more uncomfortable and decidedly shortening his days. Proper treatment with the roentgen ray should follow all operations for carcinoma. In inoperable carcinoma the roentgen ray will at times act as a temporary palliative. (See chapter on Resection of Jaws.)

CHAPTER VIII

RESECTION OF THE JAWS

Partial resection of the jaws is indicated in all cases of benign growth, and in some cases of sarcoma, but is never indicated in conditions definitely diagnosed as carcinoma. Partial resection of the maxillae or mandible should be done without making extra-oral incisions. The mouth is only half open and the assistant retracts so that the small saw does not injure the lips. The saw boldly goes through the bone whether on the upper or lower jaw, disregarding the antrum in the former and the mandibular canal in the latter. (See Fig. 32.) As soon as the section is removed, the wound is packed tightly with 5% iodoform gauze and, to prevent secondary hemorrhage, the pack is left in place for seventy-two hours. In the maxillae, where an antral opening results following a partial resection, the closure may be effected by a flap as illustrated in the chapter on Maxillary Sinusitis.

The total resection of either the maxilla or mandible should not be attempted intra-orally. An extra-oral incision best adapted for the resection of the maxillae is shown in Fig. 41. This line of incision follows the natural depressed lines of the face and at the same time does not cross the path of any important motor nerves. If local anesthesia is used, combining nerve blocking with infiltration, the hemorrhage in these operations will be nil and ligation of the external carotid becomes unnecessary. The incision should go boldly through the lip and then all the way to the bone, along the ala and side of the nose, thence along the inferior border of the orbit towards the outer canthus of the eye. The lip and cheek are then retracted (Fig. 42). The next step is the extraction of the central incisor of the affected side, after which

an incision is made through the median line of the palate; and at the junction of the hard and soft palate the incision is carried laterally until it reaches the cheek. This latter incision separates

FIG. 41.—Incision for the excision of the left maxilla. The line of incision follows the natural grooves and folds of the face, and the point of the scalpel is directed to the bone throughout the entire length of the incision.

the maxilla from practically all posterior attachment. A chain saw held in the jaws of long hemostats is then carried through the nasal opening of the affected side and is retrieved through the mouth just behind the bony palate (Fig. 43). By grasping

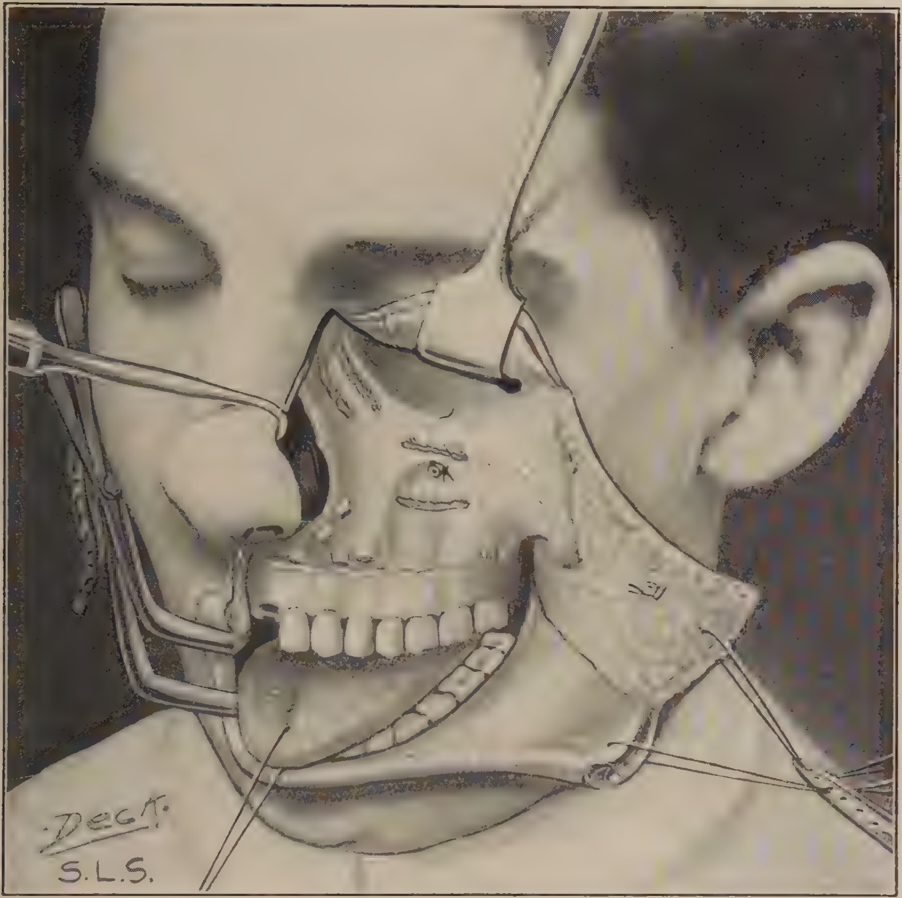


FIG. 42.—The flap has been turned back, the infra-orbital vessels have been tied between two catgut ligatures and severed. Note that an intra-oral incision has severed the cheek connection to the maxilla. The incision is made as high up in the fornix as possible.

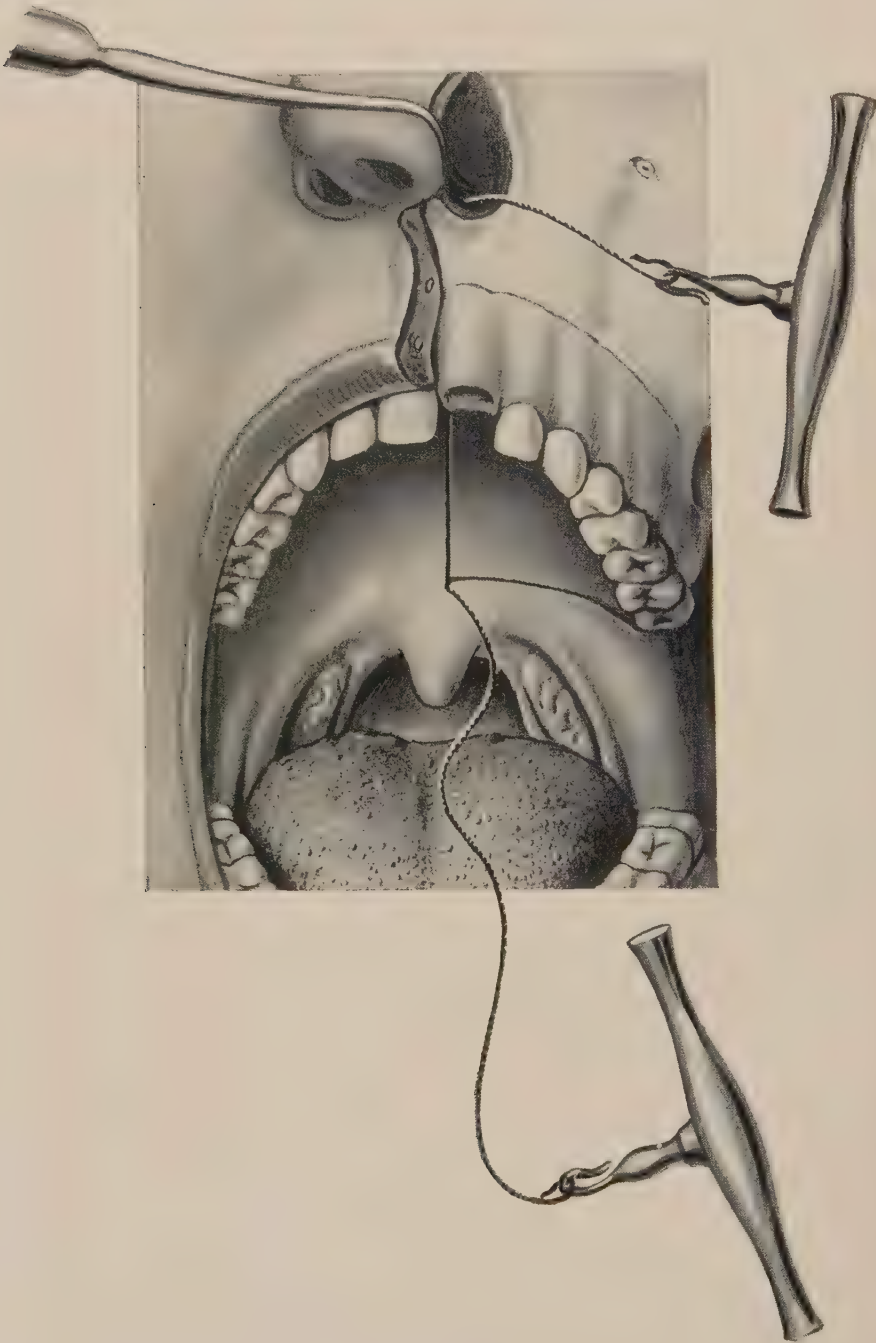


Fig. 43.—The Gigli saw has been piloted through (see text) and the median section of the maxillae is about to be made. Note the lateral incision at junction of hard and soft palate, intended to preserve the latter.

both ends of the saw the section is completed through the median line, leaving the maxilla attached to the orbit above, to the nasal bones in front, and to the pterygomaxillary attachment and the malar bone behind. With the aid of chisels and bone forceps and a small saw, these attachments are separated from the maxilla, using the saw shown in Fig. 44, wherever the application seems feasible. Several good blows on a chisel, placed just behind the tuberosity and in front of the pterygoid plate, will readily separate this attachment. The jaw is next grasped by a stout pair of lion forceps and twisted from side to side, using scissors to separate any remaining soft tissue attachments (Fig. 45). The wound is then packed with a single large piece of iodoform gauze and the external wound is sutured accurately in place, care being taken to approximate the vermilion border so that no uneveness will result. As above stated, if this operation has been done under block anesthesia, supplemented by infiltration, there will be no need of ligating the external carotid artery. Two doses of morphine should be given prior to the operation, administering them half an hour apart. This procedure will lessen shock and insure a more docile patient. Heinrich Braun says, "Local anesthesia has completely changed the operation for resection of the upper jaw. It cannot be considered a serious operation today, having lost its terrors, and the difficulties and dangers have been materially lessened. A preliminary operation is not necessary, such as tracheotomy, ligation of the carotids or the

FIG. 44.—Surgical saw.

intubation of Kuhn, as there is scarcely any hemorrhage. In ten resections of the upper jaw, we have not lost one, and have never had a post-operative lung complication." The same is even more applicable to the operation on the lower jaw.

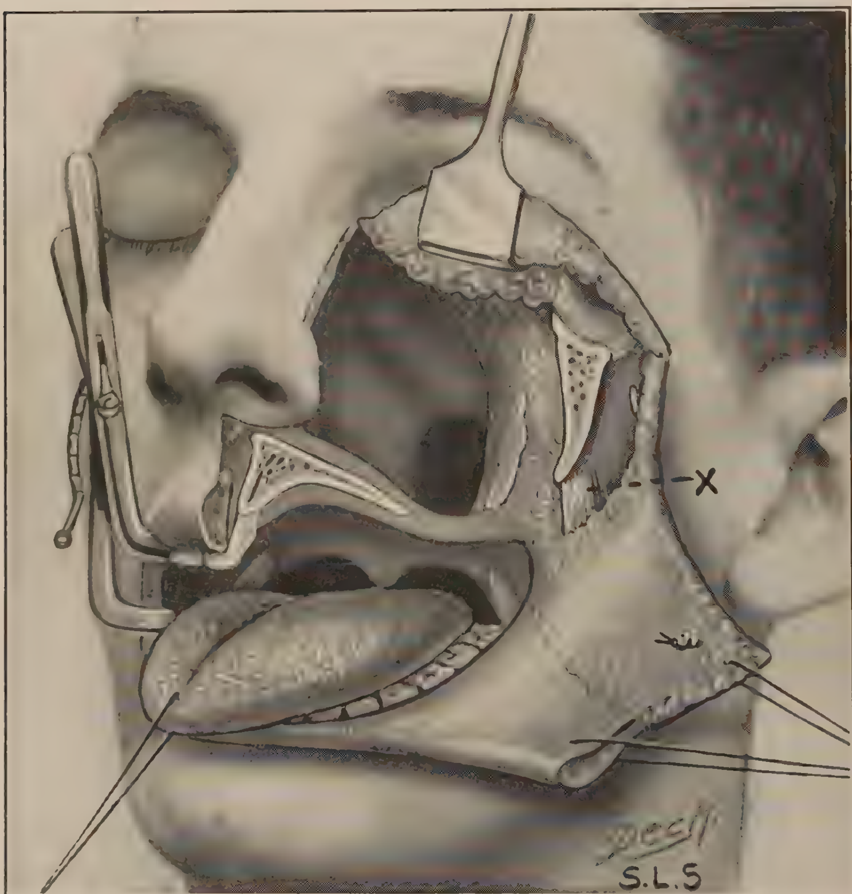


FIG. 45.—The left maxilla has been excised. The saw shown in Fig. 44 is used to sever the malar and nasal attachments. The soft palate is left intact, thus insuring function of speech following prosthesis. *X* marks the anterior fibers of the masseter muscle.

RESECTION OF MANDIBLE

The removal of the mandible is a comparatively easier operation than that for the removal of the maxilla. This is due to the fact that in the case of the mandible only one bony section

is necessary, and that at the symphysis. The incision shown in Fig. 46 is designed not only to gain access, but to avoid injury to motor nerves (branches of the seventh) and arteries of importance, the facial in particular (Fig. 47). This operation, like the

Fig. 46.—Incision for the excision of the right half of mandible. The scalpel goes boldly through the lip directly to the bone, but as the inferior border of the mandible is reached, the incision only extends through the skin and superficial fascia.

one just described, is also best done under a combination block and infiltration anesthesia. The incision for the resection of the mandible is boldly carried down the median line directly to the bone, but as the incision reaches a point under the chin, the knife

FIG. 47.—*A*, facial nerve; *B*, facial vein; *C*, facial artery (Modified from Sabotta & McMurrich).

is only allowed to cut through the skin, subcutaneous tissue and through the platysma myoides muscle. The incision extends

FIG. 48.—*AA*, shows severed and ligated facial vessels; *B*, submaxillary gland.

backward to a point under the lobe of the ear. While the incision at the median line has severed the mucous membrane, thus allowing the mouth to communicate with the wound, the rest of the

mucous membrane along the muco-buccal fold is *left intact* until all other sections have been completed. When the flap is pulled

FIG. 49.—*A*, severed masseter muscle; *B*, hypoglossal nerve.

backward, and upward, the facial artery and vein will pull the submaxillary gland from its seat on the inner surface of the horizontal ramus. The vessels are severed between catgut ties,

and the gland removed in its entirety (Figs. 48 and 49). The central incisor of the affected side is extracted, after which a small

Fig. 50.—Central incisor has been extracted. The jaw is being sectioned at the mid line. Note that the muco-buccal attachment has not, as yet, been severed.

straight saw or surgical bur is used to divide the bone at the median line (Fig. 50). The inner surface is then freed from all soft tissue attachment, using a blunt periosteal elevator. This is

easily accomplished except in the region of the genial tubercles. Here it may be necessary to divide the muscles at their origin.

FIG. 51.—The muco-buccal fold has been incised. The temporal muscle has been divided at the coronoid process. The capsule of the tempero-mandibular joint has been incised and the internal maxillary artery has not been endangered (see text).

The masseter muscle is divided rather than lifted, care being taken to make the division at a sufficiently low level to escape

injuring the facial nerve. The pterygoids and the temporal muscles are next divided. By forcibly depressing the cut end of the mandible, the capsule of the tempromandibular joint is seen and divided. This should be done cautiously so as to avoid injury to the internal maxillary artery. If the division of the capsule of the joint is made sufficiently high, that is to say, as near the articular head of the condyle as possible, the artery will be avoided, as its location is well below the articular surface. The

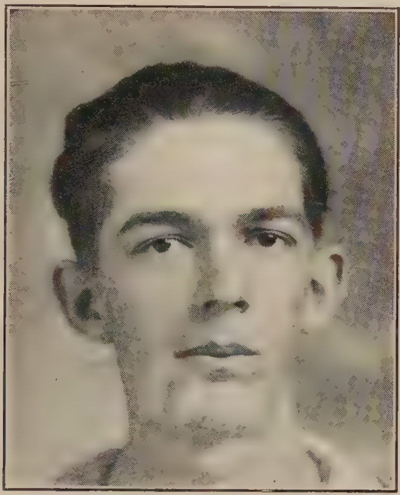


FIG. 52.—Result following total excision of the right half of mandible. See Figs. 65 and 66 for roentgenograms of this case.

actual dislocation of the mandible can be done safely by repeated twistings and blunt dissection (Fig. 51). After delivery of the mandible the soft tissues are examined for any remaining pathological tissues. Catgut ties are applied where bleeding is evident. The mucous membranes of the floor of the mouth and cheek are sutured together. The platysma myoides is next sutured, followed by suture of the skin. The wound is packed intra-orally with iodoform gauze and a small rubber-dam drain inserted extra-orally (see Fig. 2). This dressing is allowed to stay three or four days and, with the frequent use of a mouthwash, the dressing is kept in

fairly good condition. An outside dressing held in place with a gauze bandage is applied to protect the line of incision. The iodoform gauze dressing may be discontinued at the end of three weeks or sooner if granulation has progressed sufficiently. If the remaining portion of the mandible is wired to the maxilla (see Intermaxillary Wiring) no marked deformity will result (Fig. 52).

CHAPTER IX

RESECTIONS OF THE TONGUE (GLOSSECTOMY OR ELINGUATION)

Small tumors of the tongue should be removed, along with a V-shaped portion of the organ. Prior to sectioning the tongue

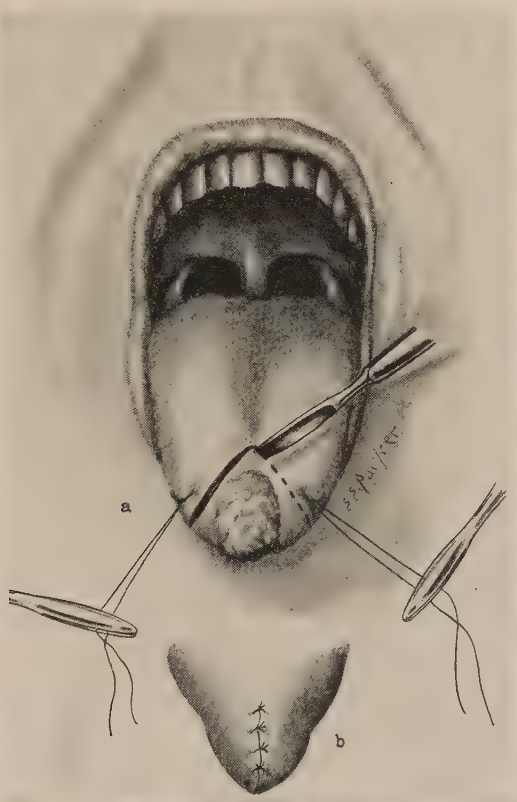


FIG. 53.—V-shaped excision of the tongue. *B*, operation complete (Bickham, "Operative Surgery," Copyright W. B. Saunders Company).

a strong suture is placed in the manner recommended by Esmarch, namely, the temporary constriction of the vessels of the tongue is

accomplished by carrying a silk suture on a large full-curved needle through the base of the tongue, piercing the dorsum and then tying a surgeon's knot. Figures 53 and 54 show the various steps and the completed operations. Excision of one-half of the

FIG. 54.—The excision of lesions upon or near the margin of the tongue. The incisions are made within the two clamps and the sutures are placed laterally to them (Bickham, "Operative Surgery," Copyright W. B. Saunders Company).

tongue is indicated in more extensive growths (Figs. 55 and 56). Whitehead's intra-oral total excision of the tongue is shown in Fig. 57. The extra-oral operation is best described by Kocher, who, in order to facilitate the removal of malignant growths at the base of the tongue, recommends a median, temporary, osteo-

plastic division of the mandible. The operation proceeds as follows:

KOCHER'S TECHNIC FOR TOTAL EXCISION OF THE TONGUE

A median incision is made through the whole thickness of the lower lip and the soft tissues of the chin. This incision is further

FIG. 55.—Carcinoma of the tongue (J. L. Campbell).

extended through the superficial structures of the neck down to the hyoid bone. From the chin to the hyoid bone the incision is identical with the author's incision for Ludwig's Angina. (See Fig. 15.) In addition to this median incision, the incision as shown in Fig. 40 may be used, particularly if the glands of the affected side are to be removed.

Prior to sectioning the mandible, holes are drilled on either side of the median line for the subsequent reception of silver wire sutures. The muscular attachments to the genial tubercles must not be divided. The two halves of the mandible are retracted

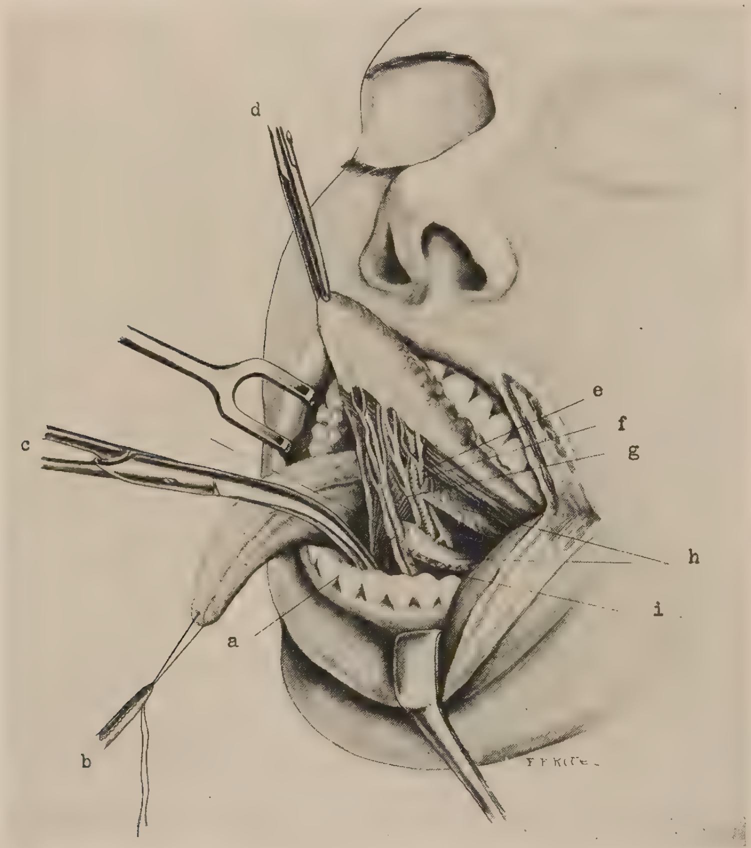


FIG. 56.—Excision of one longitudinal half of the tongue (Bickham, "Operative Surgery," Copyright W. B. Saunders Company).

laterally and the operation from this point on does not differ from those described above, except that Kocher advises the use of the actual cautery when severing the tissues immediately adjacent to the growth. Following the removal of the growth the wound is closed and a rubber drain inserted just above the hyoid bone.

Patients undergoing any extensive operation about the mouth should be propped to a semi-sitting position.

If the operations on the tongue just described are performed under a local anesthetic using a 1% procain-epinephrin solution, very few, if any, ties or ligations will be necessary. The reader

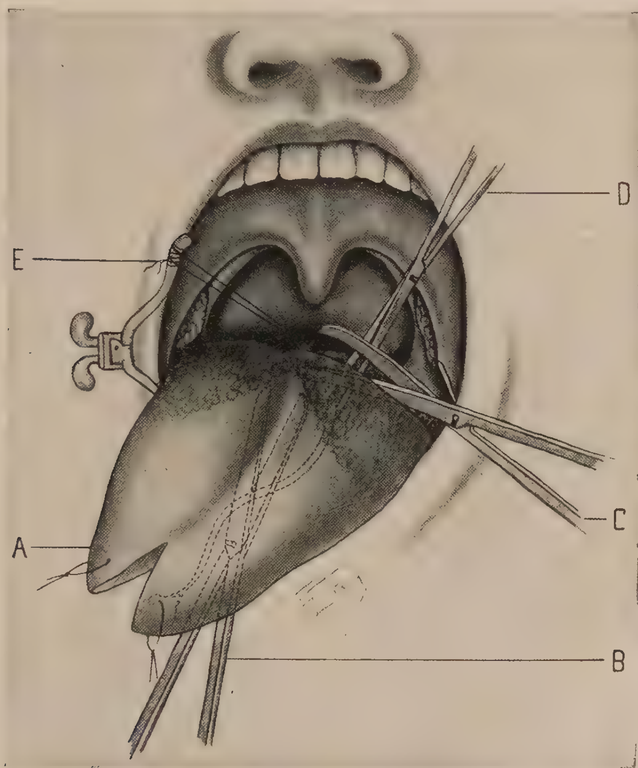


FIG. 57.—Whitehead's intra-oral total excision of the tongue. *A*, tongue may be split so that each half can be removed separately; *D*, forceps clamping the lingual artery *in situ* prior to its division by the scissors; *E*, suture placed to draw base of tongue forward (Bickham, "Operative Surgery," Copyright W. B. Saunders Company).

is, however, reminded that in addition to blocking the mandibular and lingual nerves on both sides, it is also necessary to thoroughly infiltrate the region of the base of the tongue with a ½ of 1% solution of procain-epinephrin. The needle is inserted above the hyoid bone and directed in several directions into the proposed operative field.

If a general anesthetic is used it is best to tie off the bleeding vessels as the operation proceeds, for the clamps are likely to slip off. Christopher Heath suggested passing the index finger to the epiglottis and thus be enabled to "hook" the tissues forward. This forward stretching occludes the lumen of the lingual arteries until a tie can be applied.

MALFORMATIONS AND DISEASES OF THE TONGUE

Besides all of the benign and malignant growths the tongue is heir to, it also is subject to certain congenital and acquired malformations and diseases. The following are the most observed, but in this connection let it be understood that even those to be mentioned are extremely rare.

ANKYLOGLOSSIA (TONGUE-TIE)

Definition.—Abnormal shortness of frenum of tongue.

A short frenum of the tongue, or a frenum attached too near the tip, which limits the tongue movements, and causes imperfect speech. This condition may be corrected by lifting the tongue up and cutting the taut part of the frenum, near the symphysis of the mandible. A cut by a knife or scissors farther back is likely to result in excessive hemorrhage. If done under an anesthetic, the wound may be sutured with fine catgut. Tongue-tie must not be confused with Glossolysis (paralysis of the tongue) as is often done, and no hopeful prognosis should be made until it is ascertained that the condition is simply tongue-tie.

MACROGLOSSIA

Definition.—Enlargement or hypertrophy of the tongue.

The condition is rarely noticed in infancy but is to be seen in childhood. This condition can be remedied by excising a V-shaped portion of the tongue as illustrated on page 77, Fig. 53.

BLACK TONGUE OR HAIRY TONGUE

Definition.—A black pigmentation of the dorsum of the tongue, the papillae simulating hair.

Keeping the tongue clean and the use of a mouthwash is sufficient to allow the organ to return to normal. This condition does not seem to predispose the organ to cancer.

INJURIES OF THE TONGUE

Biting of the tongue during epileptic convulsions often results in a more or less serious injury, and profuse hemorrhage. Railroad and automobile accidents are also a prolific source of tongue injuries.

The treatment consists of carefully approximating the severed portions, and suturing with fine silk ligatures. Stitches may be removed in four or five days.

GEOGRAPHIC TONGUE

Definition.—Scaly patches on the tongue which have a map-like appearance.

This rare disease occurs most frequently in children. The dorsum of the tongue is usually the site of the affection.

Treatment is of no avail but the condition usually clears up spontaneously, leaving smooth scars.

GLOSSODYNIA

Definition.—Pain or neuralgia of the tongue. See chapter on Trigeminal Neuralgia.

CHAPTER X

DISEASES OF THE SALIVARY GLANDS

MUMPS (PAROTITIS)

Definition.—A contagious febrile disease with inflammation and swelling of the parotid gland or glands.

Occurs more frequently in young adolescent males than in females. It may occur in either sex in later life.

Symptoms are chiefly pain behind the ascending ramus of the mandible, particularly when mastication is attempted or when taking any acid food. The swelling is very marked. The disease may spread to the other salivary glands and may metastasize to the testes, mammae, or ovaries.

Prognosis is very favorable and the only treatment necessary is rest in bed and dry heat applied to the affected parts. Occasionally a case may fail at resolution and terminate in suppuration. In fact, this type of mumps is the only one the oral surgeon ever sees, the simpler forms are usually treated by the family physician. The treatment here is free incision and drainage, care being taken to incise in line with the facial nerve (see Fig. 47).

RETENTION CYSTS

Definition.—The accumulation of physiologic secretion in a gland or duct, due to the obstruction of the duct.

RANULA

Definition.—A cystic tumor under the tongue, resulting from obstruction of the duct of the sublingual gland or one of the mucous glands beneath the tongue.

The stoppage of any of the salivary ducts emptying on the floor of the mouth, whether due to salivary calculus or other

foreign obstructions such as toothbrush bristles, etc., may cause a ranula. The diagnosis is easily made; ranula is nearly always ushered in with a steadily increasing swelling upon one side of the lingual frenum, finally crossing the median line (Fig. 58). Its appearance is characterized by a metallic-blue tint showing some

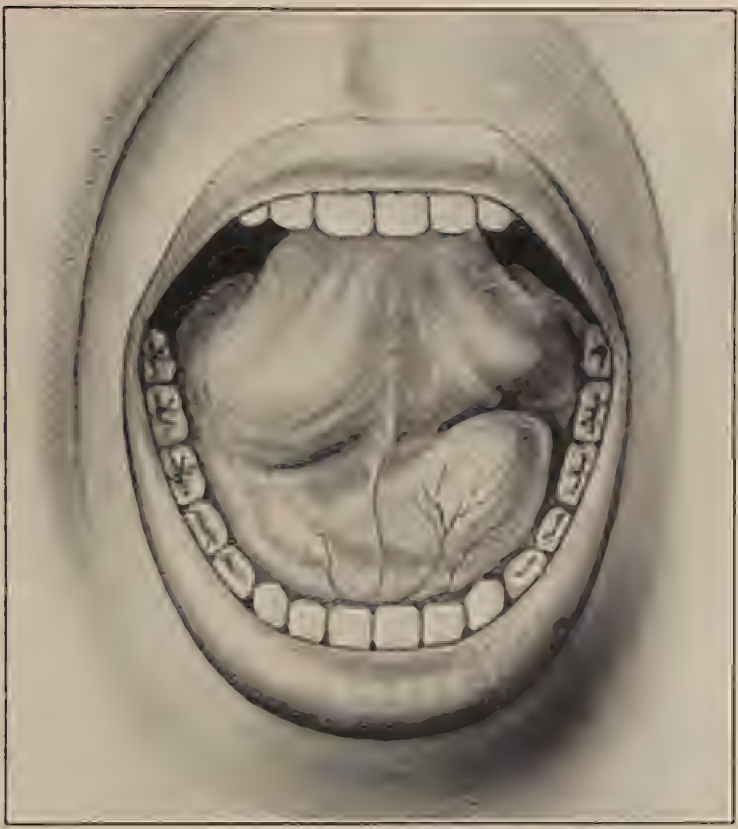


Fig. 58.—Ranula.

veins quite distinctly. There is no pain accompanying this condition, not even to moderate pressure. The growth is felt to fluctuate in the early stages but becomes rather firm as the condition is allowed to progress.

The prognosis is good, providing the proper treatment is given, otherwise recurrence is to be expected. Dr. Brophy's treatment is

effective but the silver ring he advocates inserting is rather uncomfortable for the patient to wear beneath the tongue, especially so since it must remain in place several weeks. The method of Partsch is perhaps the best plan for procuring good results. The operation consists of making an incision and swabbing out the

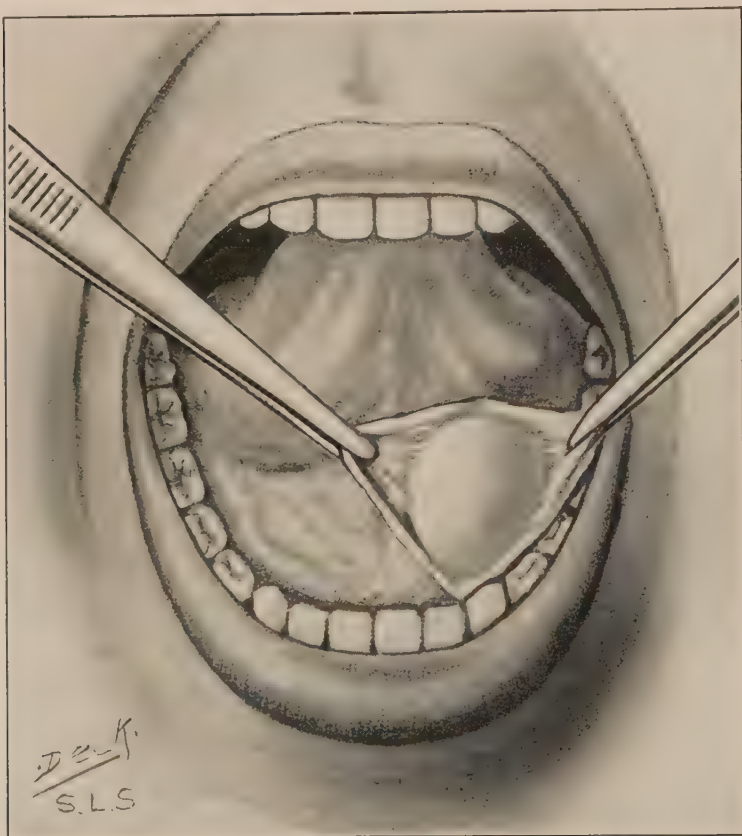


FIG. 59.—Membrane has been incised revealing the ranula (Modified from Berger).

contents of the cystic cavity. Part of the stretched mucous membrane is next removed (Fig. 59) by use of curved scissors; the cystic membrane is then stitched to the raw edge of the membrane of the floor of the mouth. Thus the base of the cystic membrane becomes part of the floor of the mouth (Fig. 60), but soon colors up to that of its surroundings.

Comedo, commonly known as "black heads" are retention cysts due to the stoppage of sebaceous ducts. Digital pressure easily expels them.

Muciparous cysts of the mucous membrane of the mouth and lips are quite common. They vary in size from that of a pinhead

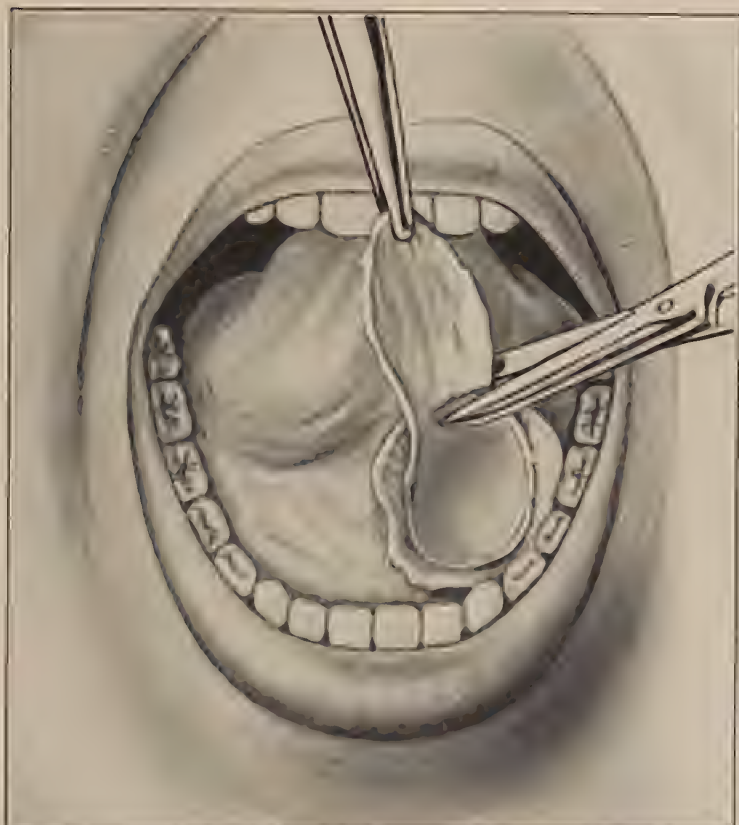


FIG. 60.—Scissors are used to remove the upper half of the cyst membrane. The lower half is sutured to the floor of the mouth (Modified from Berger).

to the size of an almond. The mucous membrane covering these cysts is very vulnerable, due to its extreme thinness.

The diagnosis is not difficult, because the cyst is very near the surface and the contents are visible through the transparent membrane.

The treatment consists of incising the membrane, removing the fluid contents, and the application of 2% silver nitrate. Suturing may be needed in the larger muciparous cysts.

Salivary calculi (*sialolithiasis*) and other solids may obstruct the mouths of the ducts of Stenson and Wharton as well as those emptying the sublingual glands.

The symptoms are swelling and severe pain, particularly when hunger manifests itself. At the thought or sight of food the obstructed saliva will cause quite a bit of distress. A small silver

FIG. 61.—Arrow points to calculus in Wharton's duct.

probe and a careful roentgen ray examination will often establish a diagnosis (Fig. 61).

The treatment consists of first attempting to dilate the orifice of the duct by inserting a silver probe, then by pulling the probe from side to side, and finally milking the duct towards its orifice. If the foreign substance resists this treatment it is best to cut down on it under local anesthesia. After removing the calculus or other body a small piece of iodoform gauze is packed into the wound

with considerable pressure; this dressing is changed every forty-eight hours for a period of a week, after which no further treatment is necessary.

Sometimes in cases where obstruction is of long standing, the glands may suppurate, in which event drainage should be instituted as recommended for dento-alveolar abscesses (which see).

SALIVARY FISTULA

Definition.—An abnormal opening of a salivary duct.

Following certain extensive injuries with great loss of tissue an external salivary fistula may result. The cheek is particularly liable to have saliva discharge on its outer surface. This is a very distressing and annoying complication and often taxes the ingenuity of the oral surgeon.

Treatment.—The mesial end of the duct is identified and if possible a probe is inserted and the tissues pulled towards the alveolar ridge. An incision is then made on the inner surface of the cheek 3 mm. below the probe and parallel with it. Another parallel incision is made 3 mm. above the probe. Thus a small flap, containing the discharging duct, is isolated; by suturing the edges of the incisions, the external fistula will be converted into an internal one. The outside of the cheek is then closed and a dressing applied.

Modifications of this operation are to be used as suits individual cases, but no attention is to be paid to the immediate distortion of the cheek produced, as this can be corrected later by relief incisions.

CHAPTER XI

CYSTS OF THE JAWS

Definition.—A cyst is a cavity lined with a limiting membrane containing a liquid or soft material.

The radicular cyst (a cyst of the jaws associated with the root of a non-vital or infected tooth) is probably the most commonly observed. Its growth is very slow and when first discovered by the use of the roentgen ray, is found to encircle the apex of a single tooth root. As the destructive process continues, it gradually undermines the surrounding teeth, thereby necessitating removal of several teeth (Fig. 62). This condition, though benign in character, is capable of causing great discomfort and deformity. It is often easy to diagnose a radicular cyst by palpating the enlarged jaw and eliciting a "crackling" sound. The crepitation is due to a thinning out of the lateral wall, which fractures on being firmly pressed. The roentgenogram, however, is to be relied upon for a definite diagnosis.

The treatment for radicular cysts is the same as for dentigerous or multilocular cysts and will be described at the end of this chapter.

A dentigerous cyst is one that contains, or is associated with, impacted or supernumerary teeth. This term is sometimes employed to designate cysts of the jaws arising under normally developed teeth. As a rule, the roentgenogram will reveal an impacted tooth (Fig. 63) and although as is the case with radicular cysts, this type of cyst is not malignant, it should be operated upon at the earliest possible moment. The reason for early operation is apparent when one observes the amount of destruction. Figure 64 shows bone regeneration following operation for case shown in Fig. 63.

FIG. 62.—Radicular cyst (Roentgenogram by C. O. Simpson).

Fig. 63.—Dentigerous cyst and impacted mandibular molar.

FIG. 64.—Same as Fig. 63 after osseous regeneration

The diagnosis of a dentigerous cyst is comparatively easy, especially so if the roentgen ray is used. The prognosis is nearly always good, particularly if the removal is thoroughly done.

Fig. 65.—Degenerated multilocular cyst.

A multilocular cyst or polycyst is one composed of a number of small cysts or compartments. They may or may not communicate. This type of cyst is very rare and, like the radicular and dentigerous cyst, is benign. However, some writers claim that the multilocular cysts are capable of sarcomatous and carcinomatous

transformation (Figs. 65 and 66). The individual small cysts are separated by thin, fibrous or bony septa, demonstrable by the roentgenogram; and the contents are usually more gelatinous than those found in the other forms of cysts (Fig. 67).

Fig. 66.—Same as Fig. 65 after complete excision.

Treatment.—Excepting in the rarest instances, extra-oral incisions are not necessary, nor is total excision of the affected jaw indicated. It is true that extra-oral incisions are more convenient,

but the disfiguring scars prompts the conscientious surgeon to operate intra-orally. I have yet to see, excepting of course where

Fig. 67.—Multilocular dentigerous cyst (Roentgenogram by C. O. Simpson).

the growth is of prodigious size, a cyst that could not have been better handled from within the mouth. In the average case a sufficient amount of healthy bone can be preserved, and in due time

bone repair progresses to a point of satisfactorily reproducing the lost structure. For cosmetic reasons and for the comfort derived by the patient, the oral surgeon can safely and successfully operate so as to cause but little if any disfiguration.

There are several methods employed in operating upon cysts; but due to the disfiguration resulting from the most popular ones, the writer prefers to make his incisions along the lateral aspect of the cyst, starting at the posterior extent and bringing the scalpel forward to the anterior limit of the growth. This incision is made parallel with and about 5 mm. from the gingival margin (Fig. 68). As the incision nears the anterior limit of the cyst, it is curved upward in the upper jaw and downward in the lower, thus facilitating the retraction of a flap. The mucoperiosteum is then lifted from the bony shell by blunt dissection. Next, the outer bony wall is removed with scissors. As a result of the thinning out of the lateral walls, this is easily accomplished. Where the bone is not so easily cut, the chisel may be used. The contents, if liquid, are usually amber colored and have glistening golden-colored particles shining upon the surface; these are cholesterin crystals. After sponging the contents out, a thick membrane is seen lining the bony cavity. This is peeled out with comparative ease (Fig. 69) and the cavity snugly dressed with 5% iodoform gauze. The incision should not be sutured excepting wherever it is curved. It is the practice of some to sew up the entire extent of the wound except its anterior extremity where a small opening is left through which they insert or "feed in" dressings of strip gauze. The objection to this tunnel type of dressing is the rather slow healing, and also the likelihood of the wound breaking down and becoming infected. One other method employed consists of replacing the muco-periosteal flap against the remaining cyst wall which causes a cave-in. Although this practice has the advantage of early healing, the deformity produced is very difficult to correct even with prosthesis. Another marked disadvantage is that osseous

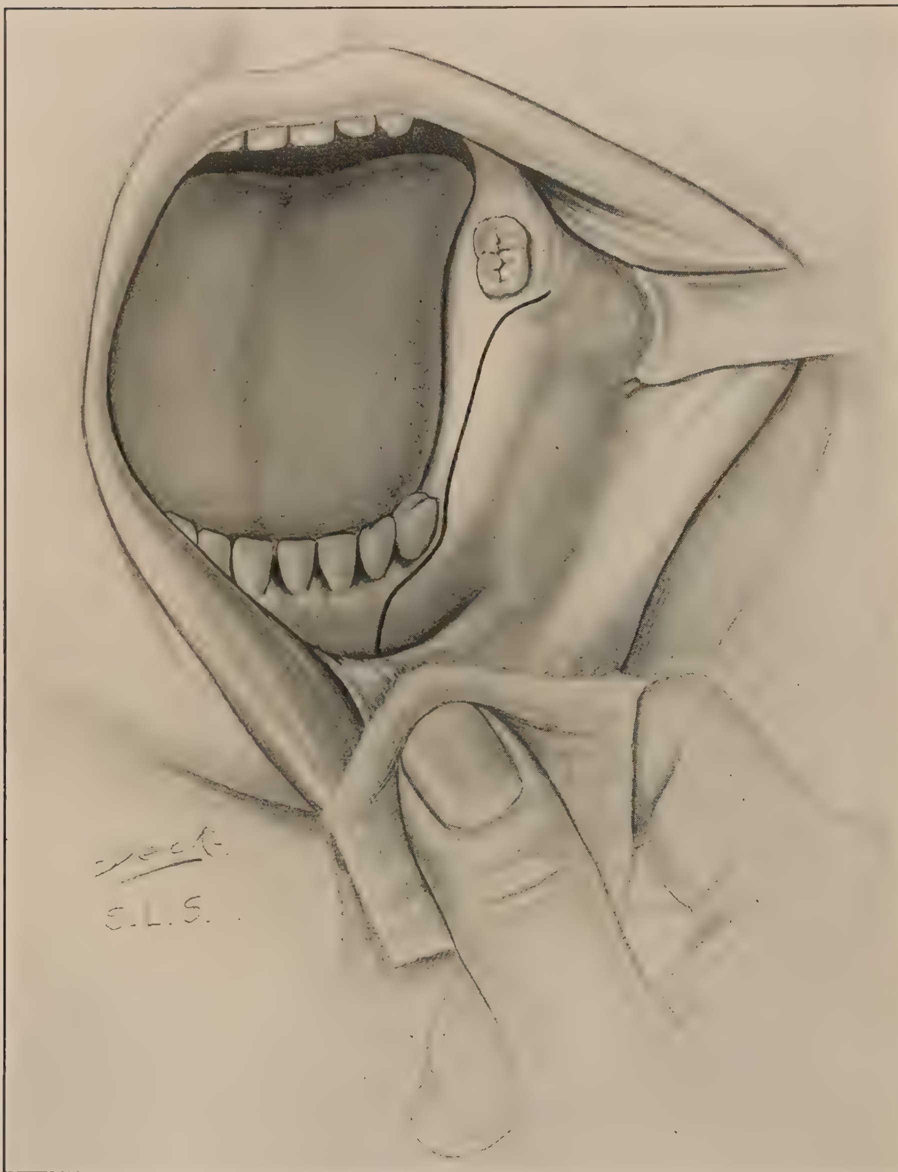


Fig. 68.—Incision for operation on mandibular cyst. The anterior portion dips downward to facilitate retraction (Modified from Berger).

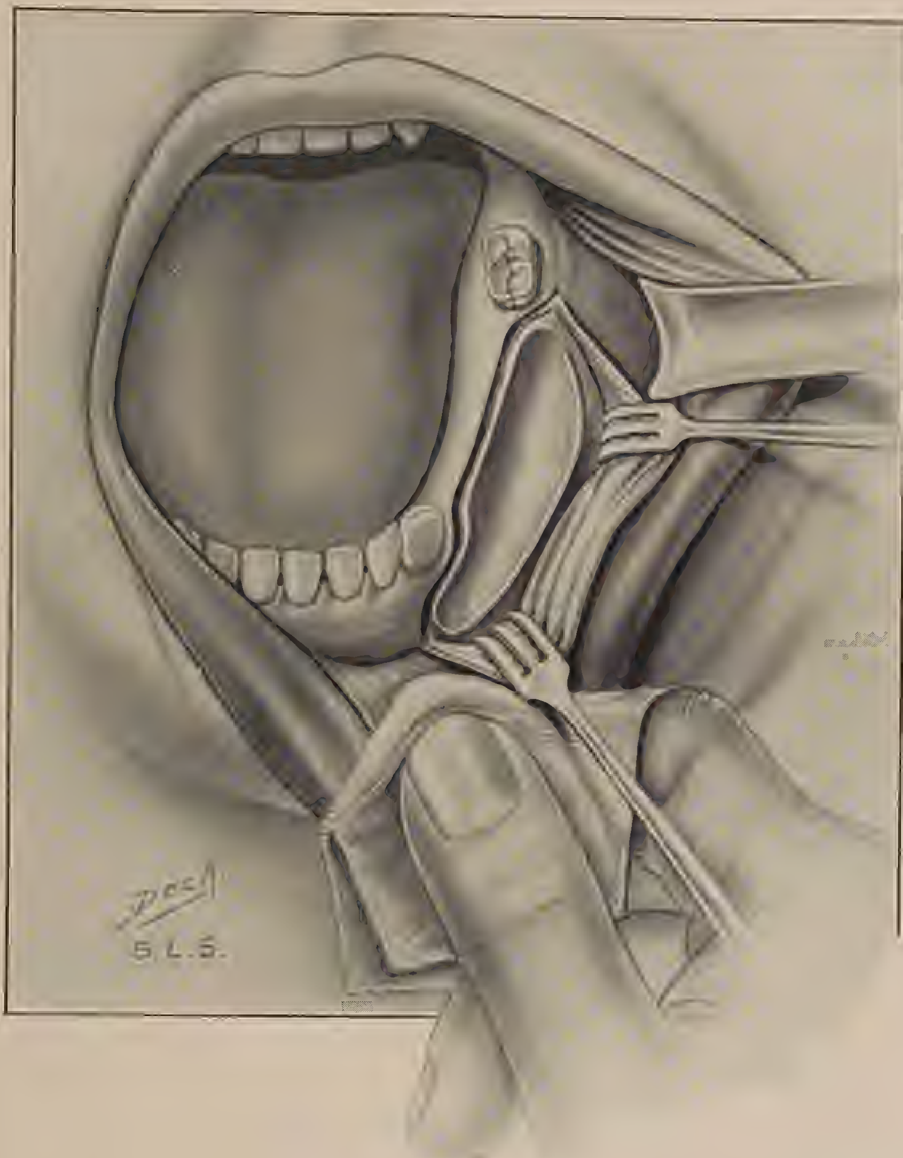


FIG. 69.—The outer cyst wall has been removed; the cystic membrane has been removed; wound ready for gauze dressing.

reproduction, as shown in Fig. 64, is absolutely prevented, and this results not only in disfiguration, but in a weak, friable jaw, very vulnerable to the slightest injury. It is hoped that the reason for the writer's choice of operation is apparent, namely, the repair of osseous tissue in as short a period as possible. This is accomplished by the use of the gauze dressing above mentioned. The dressing is changed every forty-eight hours and the cavity irrigated. If inspected from time to time granulations can be seen to form and grow, subsequently to be replaced with the osseous structure. These dressings should be continued or a gutta-percha plug inserted (to be trimmed smaller every few days) until the shallowness of the wound allows it to be flushed and cleansed by the use of a mouthwash.

CHAPTER XII

DISLOCATION (LUXATION) OF MANDIBLE

Definition.—A condition characterized by a unilateral or bilateral displacement of the condyloid processes.

While backward and lateral dislocations of the condyles have been noted, they are extremely rare. The common form is a forward bilateral dislocation of the mandible (Fig. 70). The

FIG. 70.—Left sided dislocation of the mandible (Schröder, after Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

heads of the condyles at rest normally lie in the glenoid fossae. The glenoid fossa is bounded in front by a raised rim of bone (the articular eminence) and serves to confine the condyle. When a dislocation is noticed it means that the condyles have slipped forward over the articular eminences, and the same ligaments that hold the mandible in normal relation now hold the misplaced articular heads in their new position. Dislocations are rare in the very young and in the very old, but are particularly common in

women between twenty and forty years of age. Yawning, vomiting or immoderate laughter are often the cause of dislocations. Extraction of mandibular teeth and the use of mouth-gags under general anesthesia are also common causes.

Diagnosis and Symptoms.—If there be a history of trauma, the mistake should not be made of confounding a fracture with a dislocation. The forward dislocation is unmistakable: A depression can be seen and felt just in front of the tragus of the ear, the head of the condyle is unusually prominent in its new position; the lower anterior teeth project beyond those of the upper; in the unilateral dislocations the chin is deviated towards the opposite side. Inability to close the mouth, pain in the temporomandibular region and salivation are some of the subjective symptoms. Speech and the act of deglutition are markedly affected.

Treatment.—Reduction of a dislocated mandible is very readily accomplished without the aid of an anesthetic, providing the luxation is not over a few days standing. The technic for reducing the dislocated mandible is as follows: The patient is seated erect in a low chair. The operator wraps a few turns of bandage around his thumbs followed by adhesive tape. The thumbs thus protected are placed along the buccal surfaces of the molars and pressure is brought to bear in a downward direction, the object being to bring the head of the condyles to a lower level than the articular eminences. This downward manipulation with the thumbs, is supplemented by the rest of the fingers pushing the chin in an upward direction. Sometimes the reduction is accomplished with an even gliding into position, at other times the mandible snaps suddenly into position. Should there be a tendency to recurrent disarticulation a bandage should be applied. In extreme cases of recurrent dislocation I have wired the mandibular teeth to those oft he maxillae, as described in the chapter on Fractures of the Mandible. Where a dislocation is of several weeks duration, a general anesthetic is required, and if the thumbs and fingers are unable

to bring about a reduction, it is then necessary to place a rubber or cork wedge on either side in the region of the molars, and then firmly push the chin upward and backward. The wedges act as the fulcra and the mandible as the lever. Strange as it may appear, some patients allow themselves to go untreated for several months, or even years, then neither of the above methods will bring about a reduction, owing to adhesions and the filling up of the glenoid cavities. In these neglected cases nothing short of an open reduction will avail. Incisions, as described in the treatment of bony ankylosis, (which see) cannot be avoided. The adhesions should be broken up, and the condyles replaced in the glenoid cavities. Intermaxillary wiring should be resorted to, but no attempt made to take up the slack, as movement to some extent is desirable.

SUBLUXATION OF THE MANDIBLE

Definition.—A partial dislocation of the head of the condyle with a spontaneous immediate reduction, accompanied by a clicking sound.

Frail young women are particularly disposed to subluxation. A relaxed condition of the articular ligaments and a general run down physical condition are conducive to this form of dislocation. The patients rarely have any accompanying pain but are greatly embarrassed when masticating, as the clicking sound can often be heard across the table.

Treatment.—A general tonic and liquid diet plus vigorous massage over the temporomandibular region will often suffice to end this relapsing subluxation. Where this has failed, intermaxillary wiring should be applied for three to four weeks; but before taking such steps the procedure should be clearly explained to the patient.

ANKYLOSIS (TRISMUS)

Definition.—Immobility of a joint.

Ankylosis may be conveniently classed as (1) incomplete or fibrous, (2) complete or bony. Nearly all cases of bony ankylosis

are originally unilateral, but due to disuse the opposite side also becomes affected. The chief causes for both classes of ankylosis are infections and trauma, either surgical or accidental. A type of incomplete ankylosis, referred to as *trismus*, usually accompanies acute suppurative conditions in the region of the lower third molar. It is often observed in complicated eruption of the mandibular third molars. This inability to open the jaw will, however, need no special treatment, as correction of the infection either by lancing or extraction is all that is necessary to overcome the temporary ankylosis.

Diagnosis is very simple but differential diagnosis is often very difficult. That is to say, to differentiate between a fibrous ankylosis in or near the temporomandibular joint and a bony ankylosis often requires careful examination. The roentgen rays, properly directed, are very essential for ascertaining whether or not the ankylosis is fibrous or bony, unilateral or bilateral. At times, without a general anesthetic, the character of the ankylosis can be ascertained if the jaws can be made to open. If there is any movement whatsoever, one may be assured that a fibrous ankylosis exists.

Treatment.—The treatment for fibrous ankylosis depends upon where the fibrous bands are located, as the fibrous bands occur almost anywhere along the horizontal or ascending ramus, including the head of the condyle. Wherever the fibrous bands can be reached intra-orally, they should be removed and the remaining tissues sutured. Under no circumstances should the raw surface of the inner cheek be allowed to granulate without thus suturing, as the cicatrix formed will cause a return of the ankylosis. Where the raw area is too wide for suturing, a pedicled flap from the hard or soft palate, or from both regions should be turned to fill in the cheek deficiency (Fig. 71). The flap should bear as much of the palatine artery as possible. Leaving the bone bare on the palate is not fraught with danger, as granulation soon covers it. This

operation is especially indicated where the fibrous bands are situated on the buccal aspect and attached to the alveolar processes; thus obliterating the buccal fornix above and below. To facilitate placing the flap, several teeth may be extracted and time allowed for the sockets to completely heal over, subsequently to be replaced with prosthesis. (To extract teeth for a patient

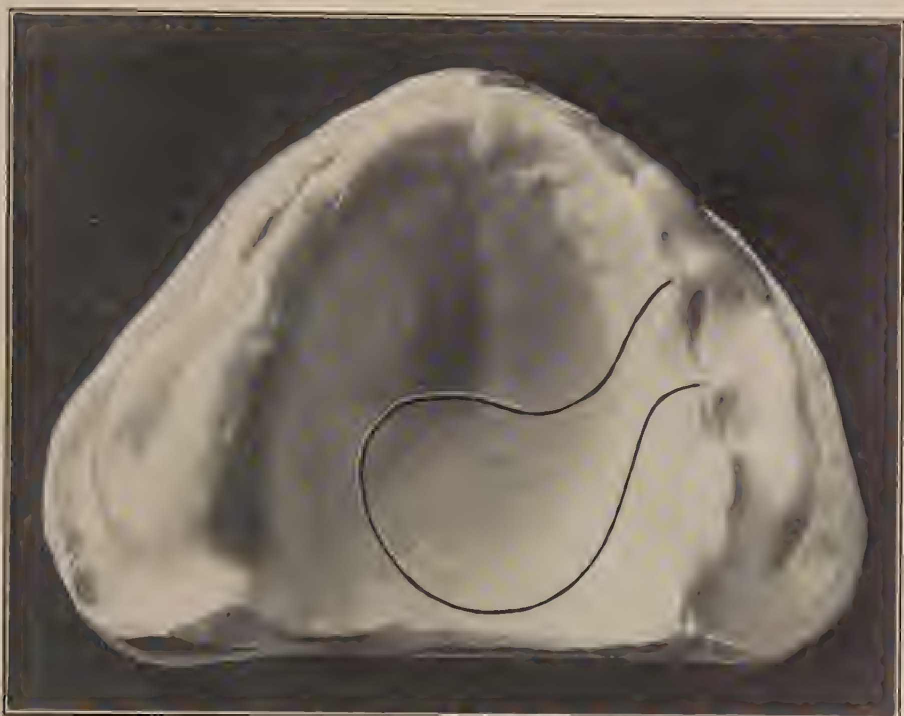


FIG. 71.—Palatal flap; may be utilized for inner cheek deficiencies.

with fibrous or bony ankylosis, a flap is turned as described on page 33. The labial or buccal bone is removed and the teeth lifted out with a suitable elevator. The flap is returned and sutured.)

In some favorable cases a screw-jack type of mouth-gag as shown in Fig. 72 may be cautiously applied while the patient is under a general anesthetic. This may be sufficient to stretch or tear the adhesions. A cork is then prepared with two gutters

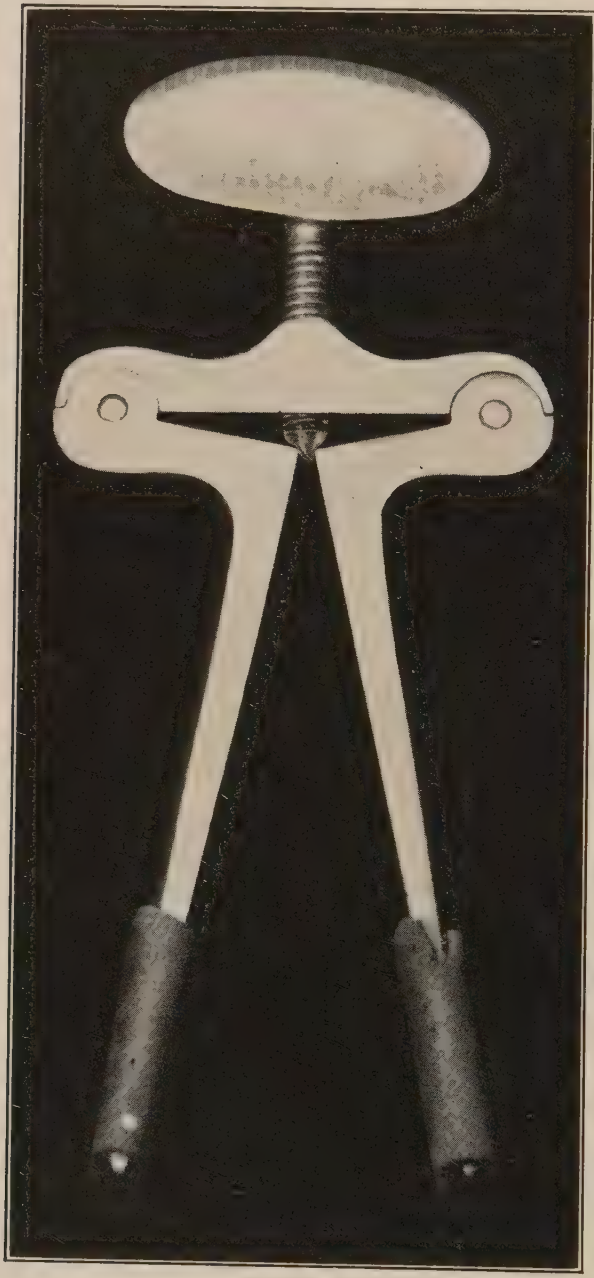


FIG. 72.—Screw mouth gag with rubber ferules used in fibrous ankylosis.

(Fig. 73) running lengthwise, and the patient instructed to insert the small end first, between the occlusal surfaces of the affected side. This is to be worn until the contracting tendency is overcome. The cork may be removed for intervals of rest. It is remarkable that children will fall asleep with this device in place, and I have seen them romping about unmindful of the cork.

Bony ankylosis, or fibrous ankylosis not otherwise to be corrected, is best treated by excision of the head of the condyle, or

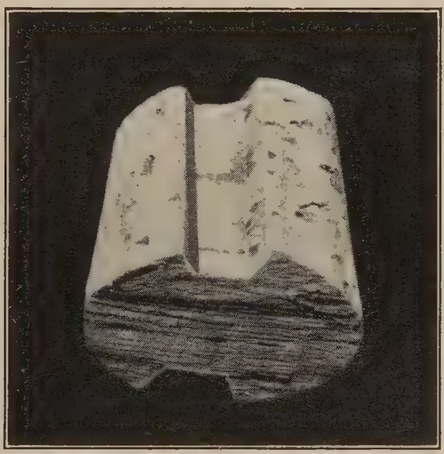


FIG. 73.—Cork prepared with two gutters to be used in false or fibrous ankylosis.

by making a false joint in the region of the angle as suggested by Brophy.

The Brophy operation I have used with success in unilateral bony ankylosis, but for fear of leaving the mouth permanently open I have never used it in bilateral cases of ankylosis. Dr. Brophy describes his operation as follows: "An incision is made beneath the angle of the jaw in the shadow line and the tissues reflected upward. With an engine bur, an incision is made in the mandible, beginning at the distal surface of the third molar tooth, extending downward and backward, and crescent-shaped (Fig. 74). The bone is now completely separated. The curved incision, it

will be seen, prevents the body of the bone from passing upward and backward at the point of separation. Once separated, a piece of gutta-percha, such as the dentist uses for base plates, is warmed and placed between the ends of the bones and bent (Fig. 75) so that it cannot be displaced. This gutta-percha is 2 mm. thick and capable of resisting great pressure, therefore, it serves the purpose of preventing the freshened ends of the bone from uniting. The

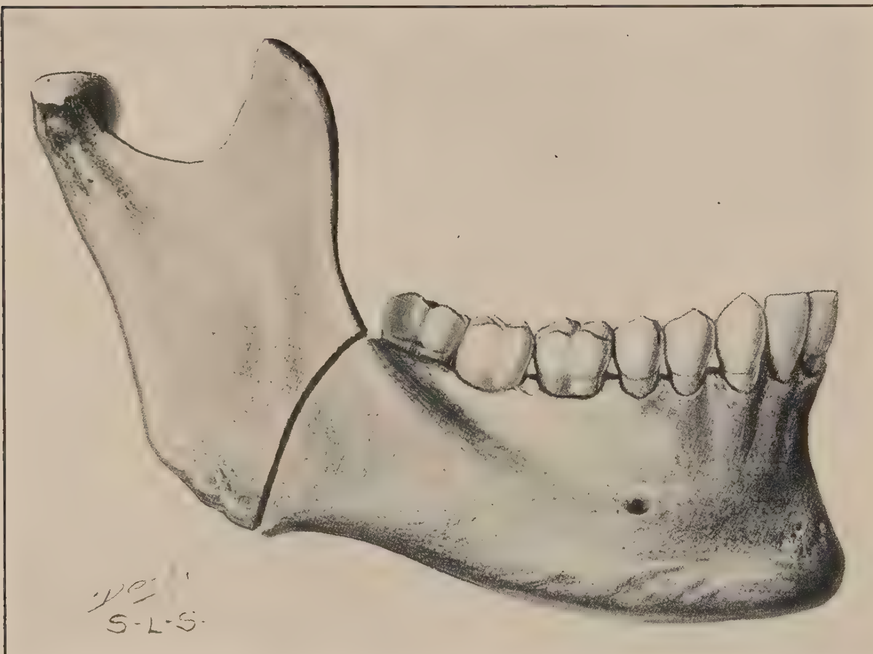


Fig. 74.—The mandible has been divided at the angle.

wound is closed leaving a small opening for drainage . . . The adjustment of a gauze dressing held by a light bandage should be employed for the purpose of absorbing the secretions. This gutta-percha is allowed to remain in place for six weeks, after which it is to be removed by reopening the original wound, seizing the gutta-percha with a pair of forceps and displacing it. On examination of the ends of the bone there will be found a membrane which is well organized, smooth and serviceable in forming inter-articular

tissue. The wound from which the gutta-percha has been removed should be closed and the joint will be found to be permanent."

Resection of one or both condyles and even the coronoid process when involved, is a time-honored and effective operation. The technic consists of first shaving all hair in the vicinity of the temporomandibular region. A vertical incision is made just in front of the ear, starting the incision sufficiently high to escape

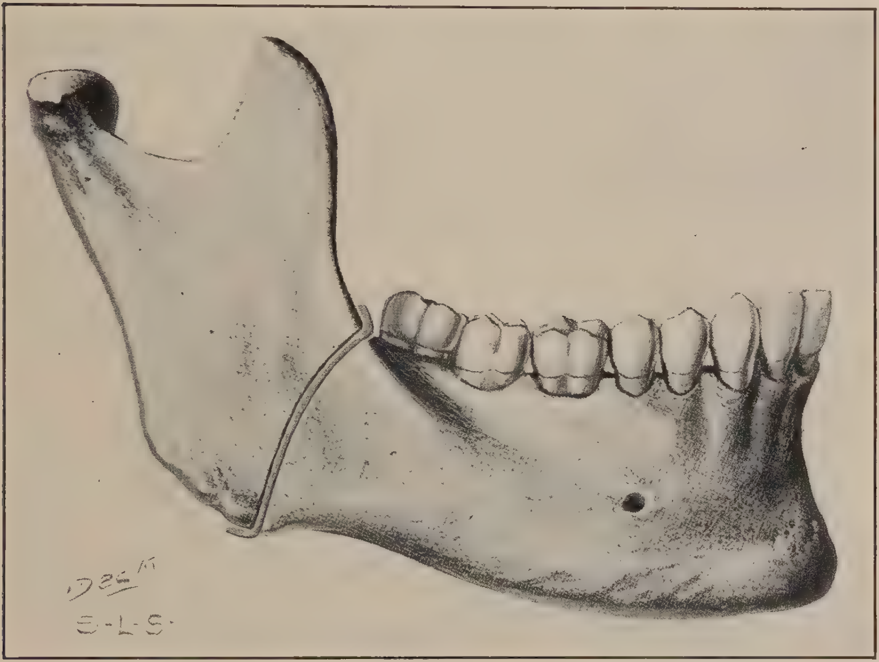


FIG. 75.—A piece of base plate gutta-percha has been inserted to prevent reunion of the sectioned bone.

cutting the facial nerve (Fig. 76). The upper end of the incision is curved forward, the length of the average horizontal part being about 25 mm. This incision is carried through superficially so that only the skin and subcutaneous tissue are cut. The flap is then laid back; next, the underlying tissue which contains the temporal artery is dissected and also turned back (Fig. 77). Sufficient amount of the masseter's posterior attachment is removed to expose the temporomandibular joint. By the careful use of a

FIG. 76.—Line of incision for bony ankylosis (Blair, "Surgical Diseases of the Mouth and Jaws").

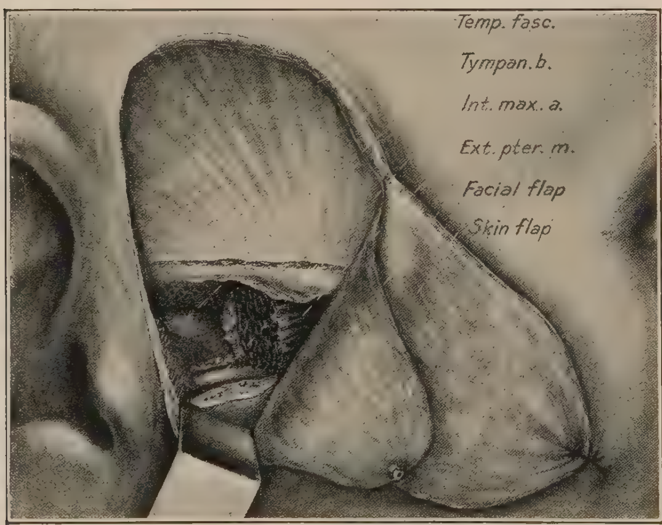


FIG. 77.—Showing cavity remaining after removing ankylosed condyle. Note fascial flap to be sutured to the bottom of the cavity (Blair, "Surgical Diseases of the Mouth and Jaws").

chisel and mallet the head of the condyle is resected. Too much twisting and deep penetration with sharp instruments is to be avoided, as the internal maxillary artery lies on the inner surface of the neck of the condyle. The temporal flap is then tucked in between the glenoid cavity and the cut portion of the mandible and sutured to the surrounding tissues. This is intended to prevent recurrence of the ankylosis. The outer flap is then sutured in place; a small rubber drain may be inserted but is as a rule not essential. A cork or piece of wood is inserted and wired to the teeth so as to have the mouth about half open. This is allowed to remain in place some ten days, after which the patient is instructed to so exercise the jaw by chewing of gum, or inserting properly prepared corks (see Fig. 73) as to insure motion.

CHAPTER XIII

FRACTURE OF THE JAWS

Definition.—A break in the continuity of a bone.

Fracture of the mandible and maxillae occur quite frequently as a result of some injury. The common causes of fractures are blows, athletic sports, automobile accidents and industrial accidents. During time of war, gun-shot fractures of the jaws are very common, particularly in trench warfare where the head only is exposed. Extraction of teeth, especially the removal of impacted mandibular third molars, has resulted in fractures. Fractures occur in men much more frequently than in women, as the former are engaged in activities that expose them to this type of injury. The mandible is more often the site of fractures than are the maxillae, due to its more prominent exposure.

There are a number of terms used to designate the types of fractures most frequently encountered: The terms *direct* and *indirect* when used in conjunction with the term fracture, signify that in the former the fracture occurred at the site of the blow, or trauma, while the latter denotes a fracture remote from the point of injury.

(1) A *simple* fracture is one where the overlying soft tissues are intact.

(2) A *compound* fracture is one that involves rupture of the soft tissues, thus allowing the fractured ends to communicate with the outer world.

(3) A *multiple* fracture denotes two or more fractures of a bone.

(4) An *impacted* fracture is one where a bone, or portion of a bone, has been driven fast into the surrounding bones.

(5) A *green-stick* fracture is an incomplete fracture, but only occurs in the partially calcified bones of children.

(6) A *comminuted* fracture is one where the bone is broken into numerous small pieces.

(7) A *pathological* fracture is one that occurs as a final result of an extensive pathological dissolution of the bone. It is somewhat common where sarcomatous destruction has taken place. Syphilis, tuberculosis, caries and necrosis are also causes of pathological fractures. This form of fracture is also referred to as a *spontaneous* fracture.

(8) A *diastatic* fracture is one that separates one bone from another at the suture junction.

(9) A *complicated* fracture is one that in addition to having a compound fracture is also complicated with fractured teeth, uncontrollable hemorrhage, severance of motor nerves, etc.

FRACTURES OF THE MANDIBLE

Fractures confined to the *alveolar process* of the lower jaw are most common in the incisor region and are always accompanied by luxated teeth.

The Treatment consists of either wiring all of the loosened teeth to the adjoining firm ones, or making a thin gold splint. Healing usually takes place in from two to three weeks. The regions of the mandible most susceptible to fracture are best shown in Fig. 78. It will be noted that the cuspid region is the most frequent and the coronoid process the least frequent site involved. Nearly all fractures are oblique or horizontal. Vertical fractures are extremely rare. Displacements of the fractured ends vary in different parts of the mandible (Fig. 79). Thus, in the region of the symphysis, displacement is only slight, due to the equalized pull of the masticating muscles. As a rule, displacement in fractures of the neck of the condyle is also slight, but if marked is always displaced forward due to the action of the

external pterygoid (Figs. 80 and 81). The greatest amount of displacement takes place in a multiple fracture, as for instance, when the cuspid and third molar regions are fractured. The long fragment in this case would be pulled down, the intermediate fragment in, and the short fragment up. Following an injury about the jaws, should the patient suddenly realize an inability

Fig. 78.—Most frequent sites of fractures occurring in the mandible. *A*, the most frequently encountered; *G*, the least.

to bring his teeth to occlusion, the diagnosis may be considered as already half made.

Symptoms and Diagnosis.—The objective and subjective symptoms are, as a rule, easily recognized. The grating sound elicited by manipulating the suspected area is called *crepitus*, and if distinctly heard, is an absolute sign of a fracture. It should

FIG. 79.—"Phantom" illustration showing fracture of the mandible and the typical displacement.

not, however, lead the surgeon to proceed with the operation without first obtaining good roentgenograms. Broken off roots of teeth, impacted teeth and additional unsuspected fractures will then, and then only, be revealed. Aside from displacement, which also includes faulty function and crepitus, swelling is a usual concomitant. Discoloration due to extravasation of blood

FIG. 80.—The zygoma has been removed to show external pterygoid muscle.

may be present. Pain is, as a rule, absent. In several hundred fractures of the jaws and bones of the face, I have had to resort but once to morphine. It appears that the more extensive the injury, the less severe the pain, due no doubt to sensory nerve compression or severance. Should infection follow, pain of course, will, be present.

Prognosis in fractures of the mandible is nearly always favorable, excepting when complicated with fracture of the base of the skull. A word of warning here is offered to those encountering unconscious patients with fractured mandibles. Years ago the writer had his mortality percentage increased by reducing mandibular fractures in unconscious patients. Post mortems revealed

FIG. 81.—Showing internal pterygoid muscle.

fractures of the base. Examination of the spinal fluid and other examinations, even though negative, are not considered as sufficient to warrant operations, if the patient remains unconscious after the accident.

Treatment.—It would take several pages to cover, even in a brief manner, the various forms of splints, bandages and other appliances that have been suggested in the treatment of fractures

of the mandible. Most methods advocated in the books of yesterday on oral surgery are now obsolete. Among the obsolete methods may be mentioned the interdental splint, that is, when used to correct fractures where a sufficient number of teeth are available for intermaxillary wiring. Another obsolete method is the use of silver wires through holes drilled into the bone. Let it be understood that these observations apply only to cases that have a sufficient number of teeth to permit of intermaxillary wiring. By far the quickest, cleanest and most accurate immobilization of a fractured mandible is the system of wiring the mandibular teeth to those of the maxillae. It has the following advantages over rubber or metal splints:

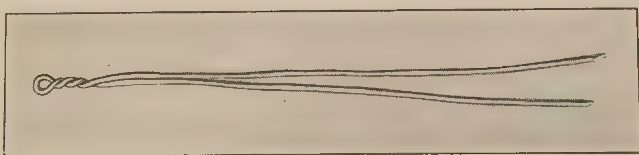


Fig. 82.—A piece of 22 gage copper wire with eyelet and sharpened ends.

Intermaxillary wiring may be done at once, no impressions are necessary; impressions are often very difficult to procure and as a result the splint may not fit, thus necessitating further impression taking. With intermaxillary wiring the occlusion is always open to inspection, whereas it is hidden under splints. A powerful spray between the interdental spaces can be used in the former, but cannot be used where a splint is in place. The outside features, particularly around the lips, are not distorted by the wires, whereas a splint causes considerable facial deformity. Where a general anesthetic is needed, as in children, the splint method would require two administrations of the anesthetic; one for the impression taking, and the other when cementing the finished splint. In comminuted fractures with loss of teeth, spiculae of bone will be found to work their way through the oral soft tissues. These can easily be removed when a splint does not cover them. As the

process of repair progresses, it is best to permit a slight motion. This is impossible with the rigid splint, but as the wires slacken, it is naturally allowed in the intermaxillary wiring method. The very fact that the use of silver wires and Lane plates necessitate external incisions, was and is sufficient reason for placing them in the obsolete class, excepting, of course, in edentulous or nearly edentulous cases.

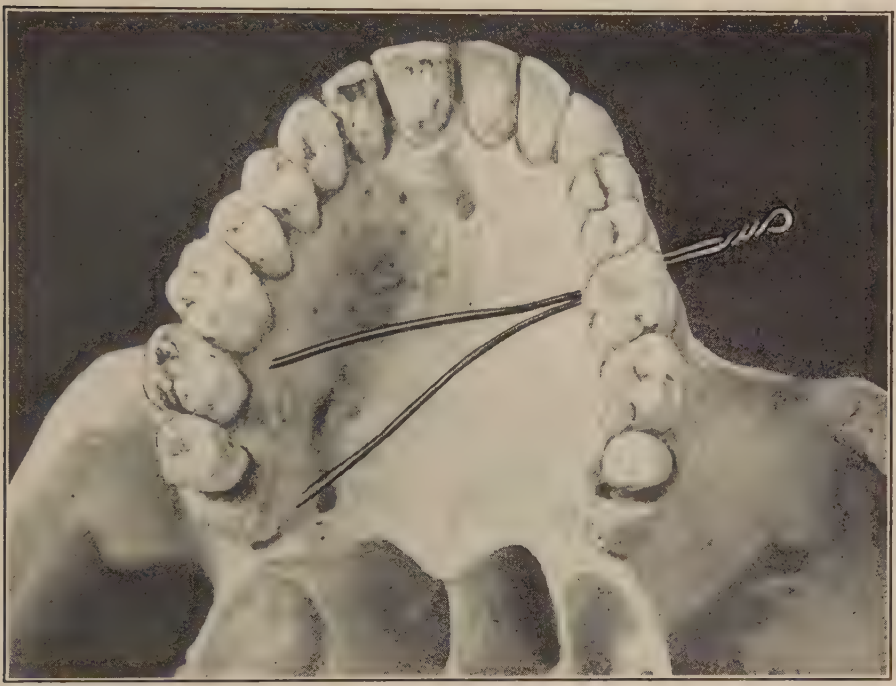


FIG. 83.—First step in intermaxillary wiring.

The method of wiring now in use consists first of making a loop in a copper wire, gage 22; this preparation is shown in Fig. 82. Both ends of the wire are cut on a bias, thus facilitating their insertion between any two teeth chosen. The insertion is always made towards the tongue, as the loop can only be utilized when seen on the buccal or labial surface (Fig. 83). One end of the wire is then sent around the anterior tooth, the other around the posterior

tooth (Fig. 84), and the ends twisted and cut off. The ends are then bent so as not to irritate the cheeks or lips. The loop, when in the upper jaw, is seen above the horizontal portion of the wire. In the lower jaw it is beneath the horizontal wire, the reason being to prevent too close an approximation of the loops (Figs. 85 and 86). In the average case six of these copper wires are prepared. Four are

FIG. 84.—Second step.

placed preferably in the premolar region upper and lower, right and left side. The other two are placed in the incisor region upper and lower. The fracture is next reduced, and by observing the occlusion the operator satisfies himself as to the perfection of the reduction. The next step consists of carrying a doubled Angle wire, gage 24 (S. S. White Mfg. Co.) through each loop upper and lower (Fig. 87). This is followed by twisting together the lower Angle wires to the corresponding upper Angle wires (Fig. 88). Should

one of these wires break, it can be replaced at any time without reopening the mouth. This is quite an advantage over all other methods of wiring. The twisting of wires is to most operators a very annoying task as they suffer them to break very often, and at most inopportune times. The art of safely and tightly twisting wires is minutely described (and illustrated) in the chapter on Cleft Palate.

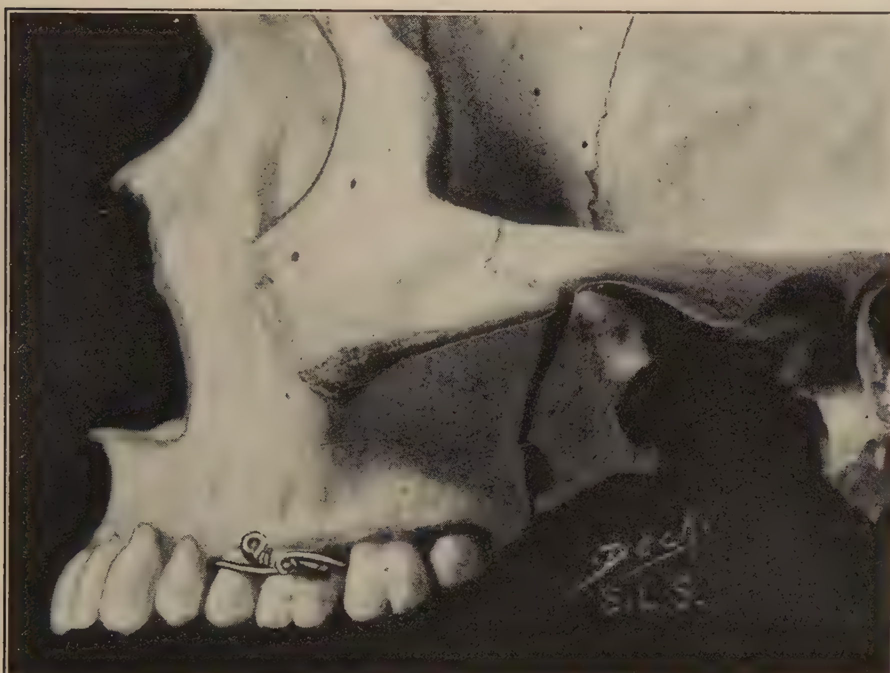


FIG. 85.—Note that horizontal wire is under eyelet.

Teeth in line of fracture, if fairly firm, should be allowed to remain, even if they are to be subsequently lost, as they help to hold the fractured ends in proper position. Sometimes isolated teeth must be included in the wiring of the jaws. Being, of course, unable to use the loop method, the operator must resort to a single copper wire around the tooth before the final tightening. An Angle wire is sent around the copper wire so as to meet its mate of the opposing jaw. The purpose of the Angle wire is to make the

method of wiring uniform with the rest of the mouth, thus facilitating repair in the event of breakage.

The method of wiring here described has been in use for more than ten years, and contrary to original apprehensions, it does not in the least jeopardize the health of the tooth or gum. In fact, copper in the presence of saliva seems to act as a germicide, consequently a beneficial, rather than a detrimental effect is noticed.

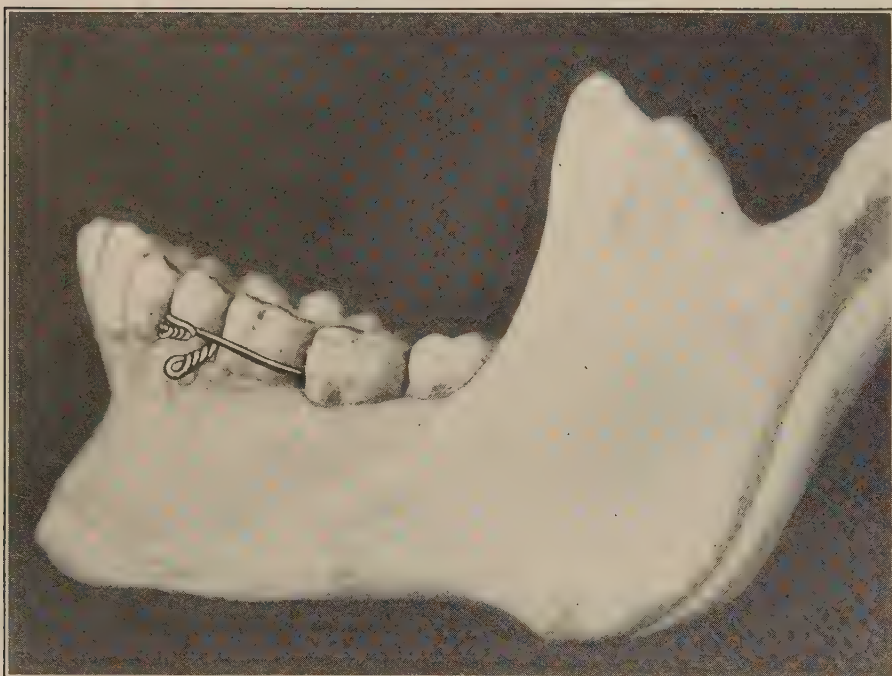


FIG. 86.—In the mandible, the eyelet is beneath the horizontal wire.

When the jaws are tightly wired together as above described, the patient is instructed to use an antiseptic mouthwash after each liquid meal. Contrary to popular belief, the taking of liquids is not difficult, as the patient soon learns to drink soups, fruit juices, the various forms of milk, such as sweet, butter, and malted milk, either through glass quills or direct from cup or glass. Under no circumstances should teeth be extracted to facilitate feeding, as the average patient usually has one or more teeth missing. More-

over, there is sufficient space behind the third molars to allow the liquids access to the throat. No patient should be operated upon who still retains solid food in the stomach. No concern need be felt about postoperative vomiting as the liquid vomitus readily finds egress by the same channels through which the liquids were swallowed. If a general anesthetic is used it is absolutely imperative that the alimentary canal be cleared of solids, particularly

FIG. 87.—The doubled Angle wires have been inserted through the eyelets.

does this apply to the stomach. If the fracture involves little or no loss of bone substance, the wires should remain in place for six weeks, after which they may be removed. No anesthetic is necessary for the removal of wires.

Intermaxillary wiring is just as effective where the fracture is posterior to the third molar as when anterior. The only precaution necessary for success consists of not only watching the

occlusion, but also palpating intra- and extra-orally and so manipulating the fractured ends, that they lock each other. This manipulation should not be done until all of the copper and Angle wires have been properly placed. This being done, the fractured ends should be placed in position and attention then given to the occlusion. While the assistant holds the mandible in position, the

Fig. 88.—The maxillary and mandibular Angle wires have been twisted together. Note that even with all teeth present, the retro-molar space is sufficient for the passage of liquid diet.

operator completes the wiring by twisting together the upper and lower Angle wires. In fractures at the neck of the condyle the palpation is not easily accomplished and the condyloid portion may not be in position. For such cases I have devised the following: To facilitate placing the condyle in juxtaposition to the rest of the jaw a 2 cm. incision is made intra-orally at the tip of the coronoid process, and running vertically downwards. A blunt instru-

ment, such as a periosteal elevator or a large, slightly curved urethral sound, is then inserted on the inner surface of the coronoid process and gradually forced backward until it reaches the inner surface of the condyle (Fig. 89). This is reached at a very shallow depth, as the head of the condyle, when not in place, is nearly always pulled forward. By using the upper jaw as a fulcrum, the

FIG. 89.—The author's operation for *irreducible displaced* fractures of the mandibular condyle. Similar fractures, without displacement, only need intermaxillary wiring.

instrument is made to carry the fractured stump to position. The intermaxillary wires are then twisted together. The small wound needs no attention, but a small gauze drain may be inserted for forty-eight hours.

In fractures complicated with loss of bone, the same method is to be used, except that the wires are kept in place for from ten to twelve weeks. The gap between the fractured ends is kept

lightly dressed with a 5% iodoform gauze dressing. Granulations soon form, which in turn are replaced by bone. The final result is, of course, not deforming, as are the cases where the fractured ends were approximated without regard to occlusion. Occlusion, in the treatment of fractures, is the key to healthy and cosmetic correction.

In *badly united fractures* due either to faulty surgery or to failure on the patient's part to apply for operation, it becomes necessary to refracture at the site of the original fracture and treat as above described. Refracturing is accomplished by making an incision, preferably within the mouth, then lifting off the soft tissues and exposing the bone. A fine saw or bur is then used to separate the bone; the wires are applied, the occlusion corrected and firmly maintained until healing takes place.

In *edentulous* cases or where the number of remaining teeth are insufficient for the method of wiring above described, it becomes necessary to drill holes on either side of the fracture and then wire the ends together with virgin silver wire, gage 20. Anterior to the second molar, the edentulous mandible may be wired from within the mouth but the healing is not as easily effected as when operating extra-orally. Therefore, I have discontinued the intra-oral approach and use the following technic: An incision 4 or 5 cm. is made just inside of the lower border of the mandible. If the fracture is anterior to the second molar, the knife is boldly carried down to the bone; if posterior to the second molar, the incision is carried through the superficial skin and fascia only. The wound is then stretched, and by alternately pulling on the lower border of the incision and sponging, the facial vessels can be seen to hug the mandible at the anterior border of the masseter muscle. The pulling will also bring the submaxillary gland partially to view. The facial artery and vein are ligated, at two points about 10 mm. apart and are then severed between the two ligatures. The incision now being direct to the lower border of the mandible, the tis-

sues including the periosteum are lifted from the buccal or labial surfaces. This is not an easy task and often requires the use of a knife rather than a periosteal elevator. The tissues in contact with the inner surface of the mandible are not tenaciously attached and are easily separated from the bone. Next a spear-pointed hand drill is used to bore a hole on either side of the line of fracture. The hole should be about 7 or 8 mm. or more from the fracture line, and above or below the mandibular canal. The course of the canal

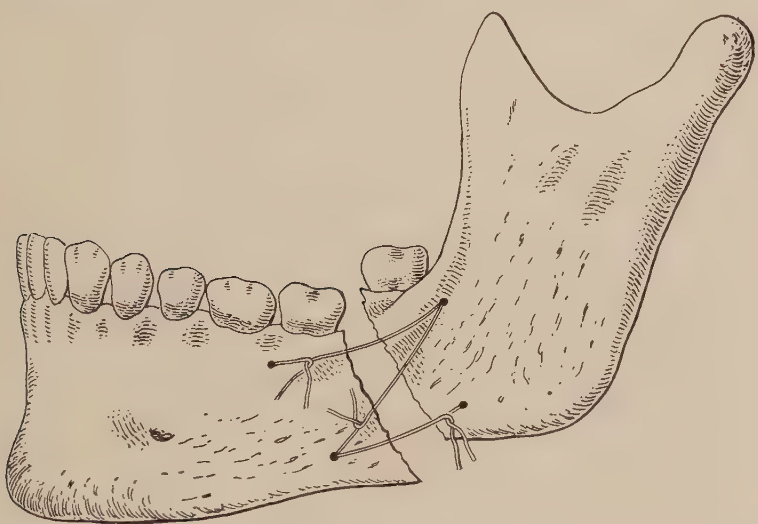


FIG. 90.—Figure shows the use of silver wires in fractures of the mandible. Illustration should show *edentulous* mandible (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

can be ascertained either by looking at the fractured ends or by taking a lateral roentgenogram. Should the holes inadverently be made to pierce the canal, the damage will not be of consequence except for a probable hemorrhage, which, however, will not persist long. The holes being prepared, a long piece (30 cm.) of silver wire, 20 gage, is then inserted through one hole, and carried from the outer to the deep surface. With the use of a pair of flat-nosed pliers, the wire is then grasped and brought through the other hole, and the two ends are twisted together. The wire must be absolutely effective in rigidly holding the fractured ends in position

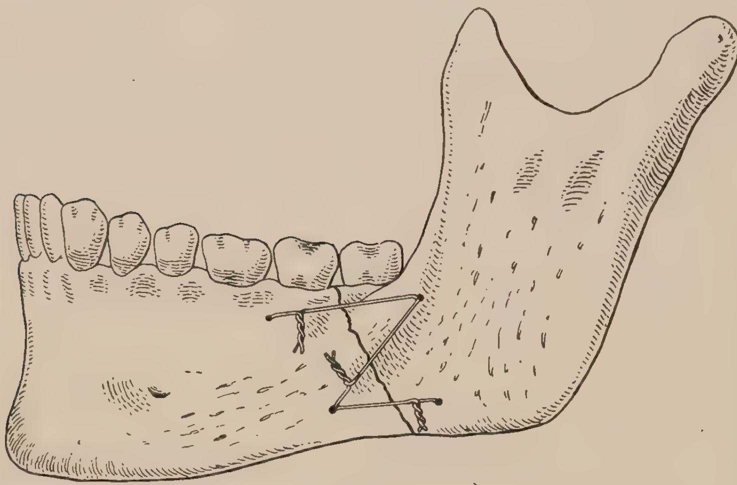


FIG. 91.—Operation complete. Only indicated in edentulous mandibular fractures (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

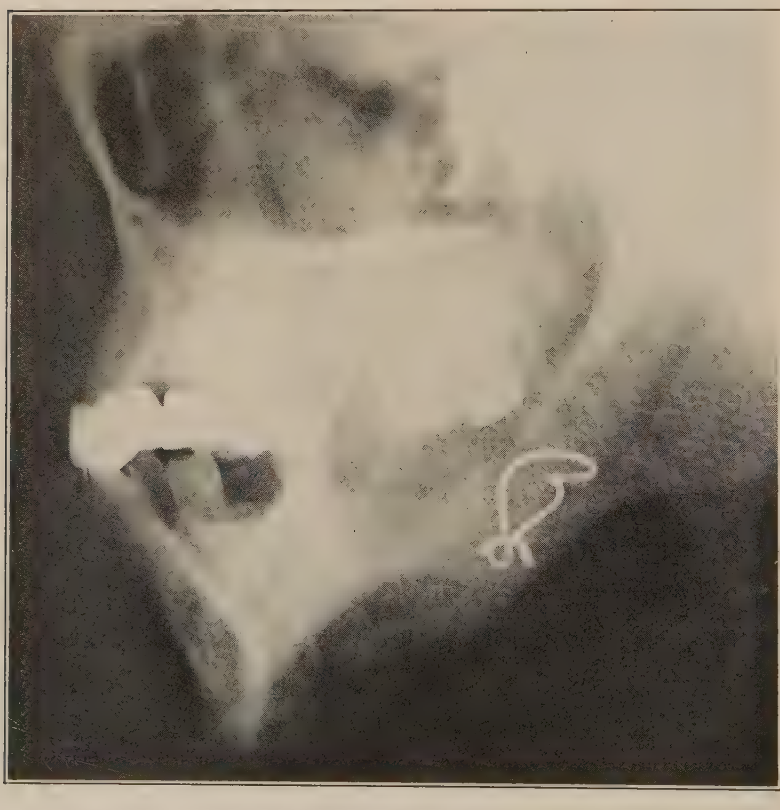


FIG. 92.—Silver wire in a semi-edentulous fractured mandible.

(Figs. 90 and 91). (For the correct method of safely tightening wires see page 303.) The fascia is then sutured with catgut, a small drain of rubber-dam is inserted and the outer wound closed with horse-hair. If this operation is done under a local anesthetic, the epinephrin content will serve to control hemorrhage; if under a general anesthetic, five drops of epinephrin to 5 c.c. of saline solution should be injected along the line of incision; the bleeding will thus be very much lessened. If the hemorrhage is allowed to obstruct the view, the holes will not readily be found, thus necessitating sending a pilot suture through, in order to retrieve the wire on the deep surface. (For pilot suture technic see page 282.) The less time consumed in this operation, the better chance there is of healing by first intention. Figure 92 shows a case where a silver wire was used to treat a fracture of the mandible in a negro man forty-seven years of age. This wire was inserted eleven years ago at the present writing (1926) and the patient has reported to my clinic yearly for observation. At no time has there been any soreness. As the roentgenogram shows, the mandible was of the typical African type. Although the jaw healed by first intention, the wire after being in place for four years, broke up as revealed in Fig. 93. This phenomenon is inexplicable. No callus is evident and the patient is entirely comfortable.

Some authors recommend the wiring together of artificial dentures for use as splints in edentulous fractures; this, of course, where the patient has dentures already in use. A bandage is then applied about the head. My experience with bandages is sufficient to warrant the statement that bandages are poor substitutes for other more rigid means of immobilizing fractured ends. The powerful muscles that open the mouth will soon stretch any bandage, even leather straps. Bandaging alone is utterly useless in the treatment of mandibular fractures, but as an adjunct, and when made of adhesive tape, rather than gauze, it serves very well. To show how it is possible to use adhesive tape as an adjunct to

9

Fig. 93.—Same as Fig. 92 nine years after the operation (see text).

the treatment of fractures, as well as to show how a patient under my care was able to maintain his weight in spite of great daily physical exertion, I here reprint what may be considered a very interesting case. What follows was published in The Dental Cosmos, March, 1922: "Adhesive Bandaging as an Adjunct to Intermaxillary Wiring."

"Ordinarily when an operator successfully brings the broken ends of a bone in juxtaposition and immobilizes them until union

FIG. 94.—Ten yards of adhesive tape used as a bandage in addition to intermaxillary wiring (see text).

has taken place, he quite naturally feels satisfied with his labor and the patient is usually satisfied with the result.

"Recently, however, the writer was called upon to not only correct a broken jaw (fractured at the neck of the condyle) but to so ensconce the fractured parts as to immediately permit the patient to continue in what may be considered the most hazardous game known to sportdom, namely, varsity football.

"This patient, 'Red' Barron, was one of Georgia Tech's football stars of 1920. He was chosen by twenty-six out of twenty-

seven football coaches as the best half-back. *And he accomplished all of this while living on liquid diet for six weeks, his jaws being firmly wired together.*

"The patient suffered a fractured jaw on October 16, 1920 and the next day I applied the intermaxillay wiring. Much to my surprise he insisted on playing both practice and exhibition games.

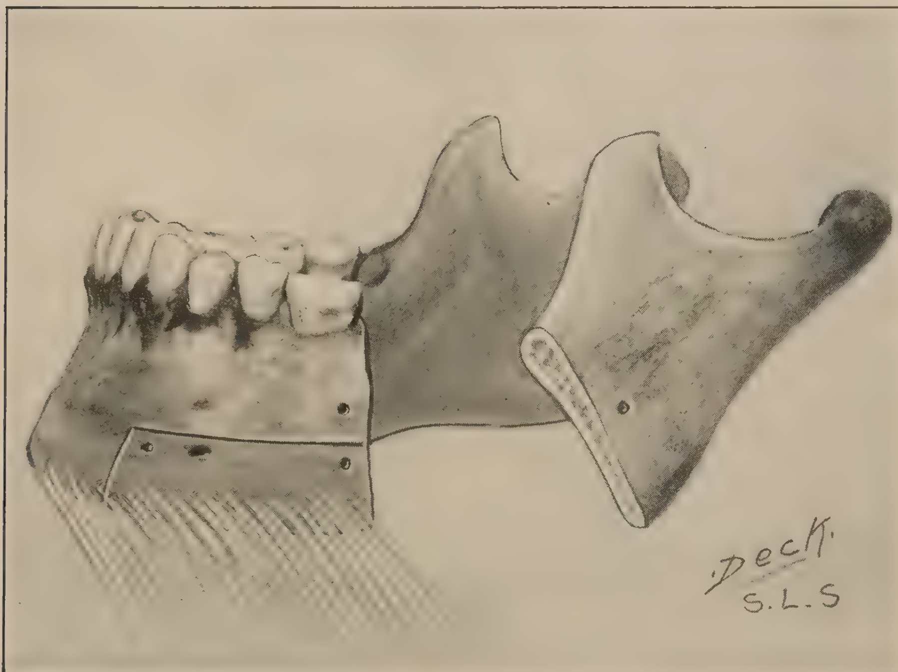


FIG. 95.—Holes are drilled prior to making section. Note that soft tissues are still attached to bone graft.

During the game between the University of Pittsburgh and Georgia Tech, part of the wiring failed to hold and as a result I decided to add the bandaging as an adjunct to the wiring, as shown in this picture (Fig. 94).

"This is not a gauze bandage, but consists of ten yards of 1¾ in. adhesive tape, wrapped vigorously and adhering to the skin, the hair only being protected by one thickness of linen. Sixteen wires were used to maintain the jaws in occlusion. Mr. Barron played

in every game and at the end of the season the wires were removed. His jaw is in perfect shape and we were able to maintain his usual weight. Contrary to popular belief, a patient on liquid diet need not necessarily lose weight. In fact, I have known patients to gain under a well-balanced and oft-repeated liquid diet consisting of soups, meat juices, vegetable and fruit juices, raw and soft-boiled eggs, and the various preparations of milk."

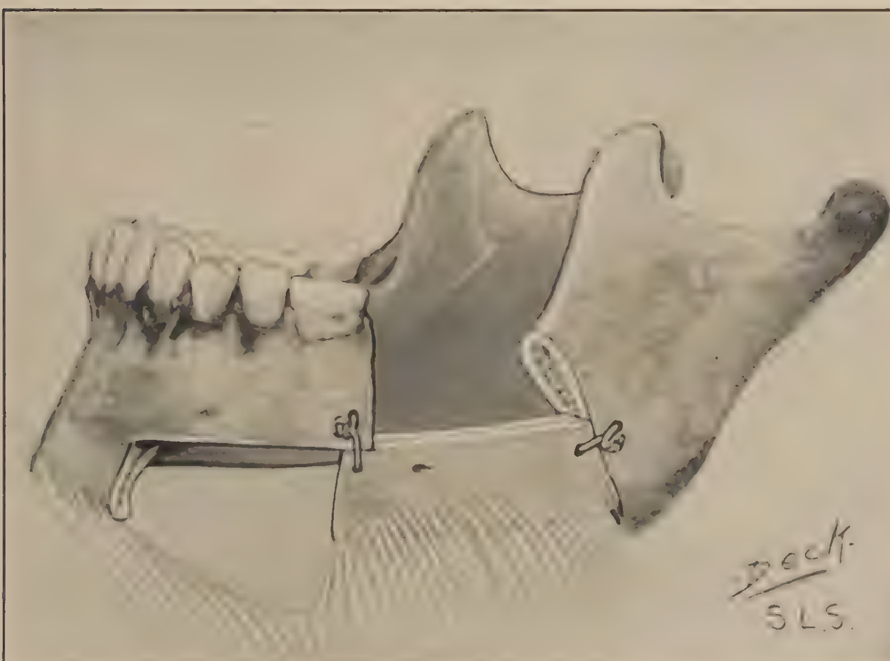


FIG. 96.—Graft wired in place.

In some cases of fractures of the mandible, particularly those received from fire arms, with consequent loss of bone, there will persist a gap in spite of the proper wiring of the stumps in their relative positions. A bone graft is then necessary. Figures 95 and 96 show method of procuring graft from the immediate structure. The advantage of securing a bone graft from the immediate structure is two-fold. First, only one incision is necessary. Next, a graft consisting of the same osseous arrangement as the bone to

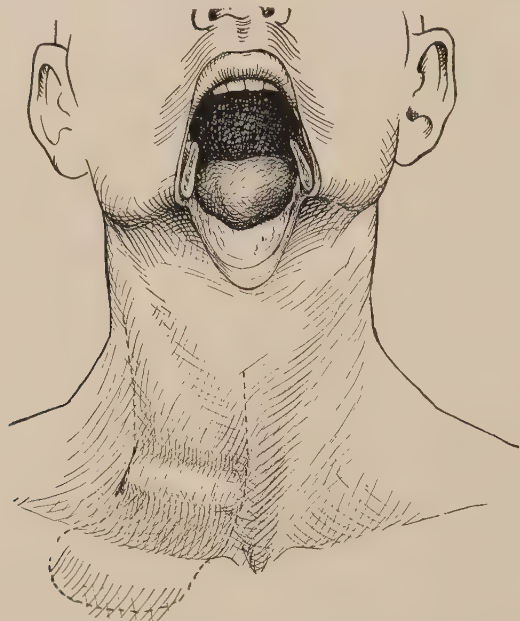


FIG. 97.—Transplantation of bone to repair bony defect of jaw at chin, showing implanted piece of rib in position (Blair, "Surgical Diseases of the Mouth and Jaws").

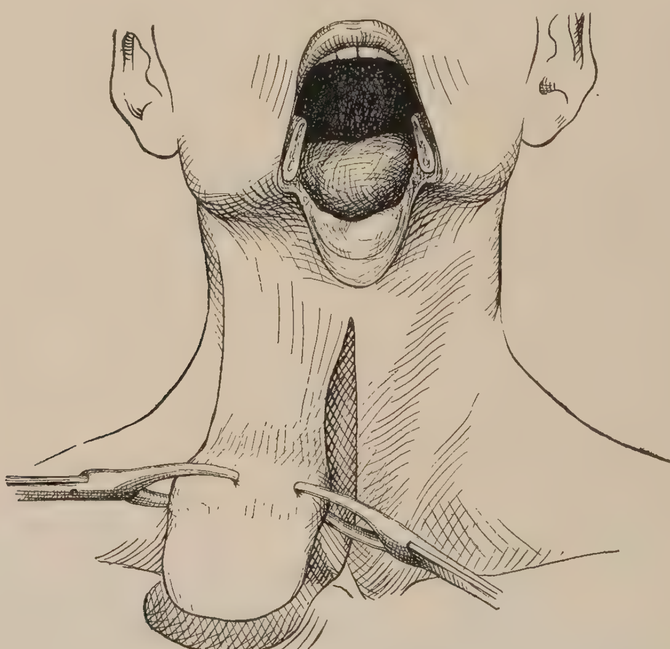


FIG. 98.—Raising the flap at second operation. The operation is completed by sewing the flap to the jaw and chin defect (Blair, "Surgical Diseases of the Mouth and Jaws").

FIG. 99.—Impacted third molar in line of fracture.

FIG. 100.—Fracture in front of mandibular cuspid. Intermaxillary wiring in place.

FIG. 101.—Fracture of mandible. The third molar was removed. Intermaxillary fixation.

which it is to be connected always takes more kindly to the operation. After wiring the graft of bone (which must have periosteal and other soft tissue attachments) in place, the intermaxillary wires which have previously been placed, are then twisted together.

FIG. 102.—Fracture of edentulous mandible (Roentgenogram by J. S. Derr).

Where loss of bone is complicated with loss of surrounding soft tissues, as shown in Fig. 97, it is best to procure a pedicled flap as illustrated in Fig. 98.

Fractures of the coronoid process alone are extremely rare and I have personally never had one in practice, but the treatment would be the same as for fractures of the condyle above described. No incision would be necessary, however, to line up the fractured ends as the periosteal elevator or index finger can reach the inner surface of the coronoid process with but little difficulty.

Figures 99 ,100, 101 and 102 show common sites of fractures of the mandible met with in local clinics.

FRACTURES OF THE MAXILLAE

Fractures of the maxillae are comparatively rare, certainly so as compared with those of the mandible. The alveolar process

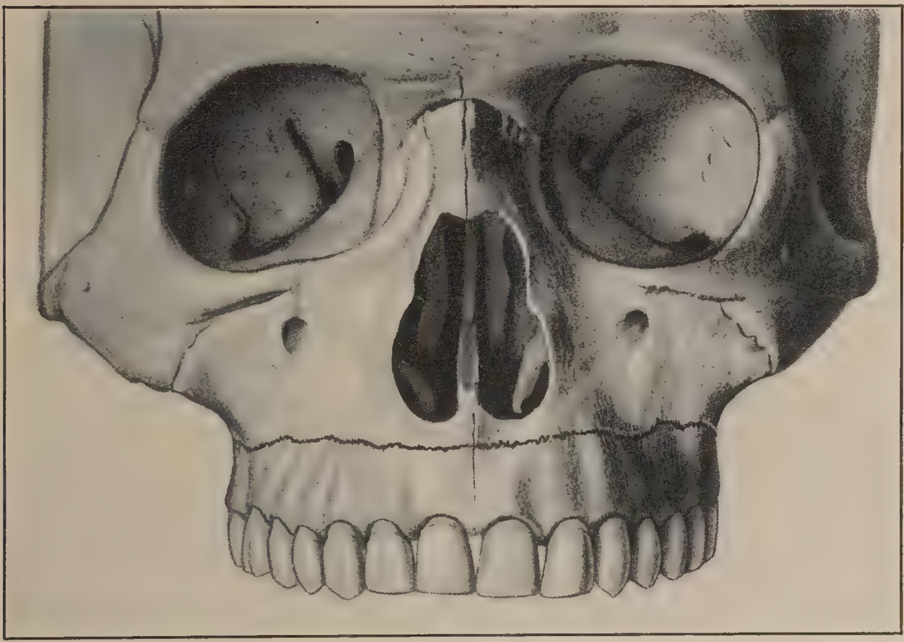


FIG. 103.—Shows lines of fracture of the maxillae commonly encountered.

of the maxillae is often fractured, especially on the labial or buccal surfaces. Fractures of the alveolar process often occur during extraction, but no treatment is indicated aside from pressing the process back into place and the use of an antiseptic mouthwash.

Loose teeth in connection with fractured alveolar process may be wired to the adjoining firm teeth, or a gold splint may be swaged or cast and cemented to place.

A common form of fracture occurring in the upper jaws is illustrated in Fig. 103 and is always the result of a violent injury. The cases coming under my observation were all caused by head-on automobile collisions, with one exception. The latter was the result of the patient's head being caught between the bottom of a freight elevator and the floor, thus receiving a powerful crushing force.

The symptoms and diagnosis are very marked. If there is external laceration of the face, the patient will breathe through the lacerated opening rather than through the nostrils. When the mouth is opened the face will appear to elongate. This is due to the fact that the maxillae, having been separated from their cranial attachments, fall with and follow the mandible. If the upper central incisors or other teeth are grasped and manipulated, the jaw is found to move in all directions.

The prognosis in fractures of the maxillae is always good, providing that no serious cranial injury has occurred.

The treatment indicated in this severe form of injury is altogether different from that recommended for fractures of the mandible. Under no circumstances should inter-maxillary wiring be considered. One has only to think for a moment and it will be immediately evident that should a fracture, as illustrated in Fig. 103, be treated by wiring it to the mandible, the result will be a continual pull on the already loose maxillae. The mandible must not enter into any appliance where a complete separation between the maxillae and the other bones has occurred. The reversed Kingsley splint is the only satisfactory appliance that can be used. Figure 104 shows the application of the splint. Note the heavy metal wings that emerge at the corners of the mouth and which are connected by a strap or piece of strong tape. The technic for

handling this type of fracture is briefly as follows: A modeling compound impression is taken of the upper jaw; while the operator is removing the compound, an assistant takes two sharp pointed punches and digs into the maxillae on left and right side just above

FIG. 104.—Inverted Kingsley splint for fractures as in Fig. 103 (Modified from McCurdy).

the impression compound. This is intended to prevent laceration of the soft tissues, or, at the worst, to prevent the upper jaw from coming out with the impression. The thin soft tissues are sometimes the only attachment in severe forms of gun-shot wounds.

Figure 105 shows a case which occurred in civil practice several years ago, and was reported in the Dental Cosmos, Oct., 1917. (See Figs. 149, 150, 151 and 152.)

The model having been poured, a splint is made, preferably of silver, and the wire wings are soldered to it. The splint is then cemented to place. If, on account of blood-clots, the jaws seem not to approximate the cranial surfaces, force must be used to cut through

Fig. 105.—Gun shot wound with loss of maxillae (see chapter on Prosthesis for further records of this case).

the intervening impediments. If still unsuccessful in bringing the fractured surfaces in contact, rubber bands are stretched from the wire wings to dress-maker's hooks, sewn to the skull portion of the appliance and this will, in a few days, bring about the desired results. If in addition to the fracture of the maxillae the mandible is also found to be fractured, it becomes necessary to either make a *separate* splint for the mandible or, in case of loss of important teeth, the mandibular fracture should be treated as described on page 126.

In addition to the Kingsley splint, it may be necessary to employ rubber tubes in the nose to allow breathing. The tubes will retain themselves, but if a tendency to slide out is noticed, a safety pin is pierced through both tubes just beneath the columella.

FIG. 106.—Result after multiple and compound fractures of the maxillae, malar bones and mandible (see text).

The safety pin is in turn attached to the skull portion of the appliance by the use of a small piece of linen string or tape.

Figure 106 shows a patient coming under my observation who sustained eight fractures of the maxillae, malar, nasal and mandib-

ular bones. (The injury was caused by head-on automobile collision.) Due to loss of important mandibular teeth, the ends of the bone were exposed through an extra-oral incision and wired with silver wire, 20 gage. No "before" photograph was taken as the patient was in a too serious physical condition to warrant unnecessary interference. Final cosmetic results in maxillo-facial surgery

FIG. 107.—Malar and maxillary lines of fracture.

are nearly always gratifying and the resulting scars and deformities are invariably less noticeable than expected or anticipated.

In gun-shot wounds of the maxillae it often happens that a considerable portion of the bone is lost. It is quite useless, however, to attempt to do any form of bone grafting in the upper jaw, as the area, on account of the natural sinuses and cavities present,

does not lend itself to bone grafting. Prosthesis, however, is of inestimable value. (See page 187.)

At times the horizontal fracture affects only one of the maxillae (Fig. 107). The treatment for this form of fracture is intermaxillary wiring of the *unaffected* side, or better still, a splint covering all of the upper teeth can be made of gold, silver or rubber and cemented in place. A Kingsley splint may, of course, be used in these cases, but intermaxillary wiring or a splint is less annoying to the patient. Where the antra are involved in horizontal fractures, they should be irrigated with a sterile saline solution or other bland wash. If infection occurs, drains must be inserted in addition to irrigation. Fractures of the maxillae heal in from three to six weeks, depending upon their extent and upon whether or not complicated with infection.

It is to be observed that adjacent bones are nearly always involved in fractures of the maxillae. The treatment, however, corrects not only the maxillae but the reduction usually replaces and holds the other adjacent fractures.

FRACTURES OF THE MALAR BONE

Due to violent direct blows to the malar bone, it is often fractured. The fracture is always depressed and impacted, and produces a sunken appearance, it may also result in a bulging of the eye. On account of this appearance the diagnosis is at once clear. The prognosis is good and the treatment easily accomplished. Figure 108 shows the application of a strong pair of tenaculum forceps (applied without making an incision) for the purpose of drawing the depressed malar forward. Once drawn forward the fractured bone retains itself. If it becomes necessary, and intraoral incision is made just over the second premolar tooth, the antrum invaded by the use of a chisel, and an iodoform gauze pack inserted to keep the malar bone from dropping in. The writer has seen several such fractures in football accidents and by the use

of the tenaculum forceps was able to correct the injury. In only two cases was it necessary to pack intra-orally. The packs were changed every forty-eight hours and the antrum irrigated. At the end of ten days packing was discontinued.

FIG. 108.—This illustration shows method of reducing a depressed and fractured malar bone without making an incision.

Fractures of the Zygoma though not, strictly speaking, in the domain of oral surgery are nevertheless interesting, inasmuch as the masseter muscle is attached to this bone. Mastication,

therefore, becomes difficult or impossible and for this reason requires immediate attention. As in the case of fractures of the malar bone, the average textbook fails to mention treatment. In

FIG. 109.—No incision has been made. The tenaculum forceps are reducing the fractured and depressed zygoma.

fact, some actually advise against any attempt at correction. With this advice I am not at all in accord.

The treatment for a fractured and depressed zygoma consists of washing the area, painting with iodine and alcohol and, without

any incision, the points of small tenaculum forceps are pressed above and below the zygoma (Fig. 109.) By heroically pressing, the points are driven past the bone, after which the forceps are closed or nearly closed, and traction made outward. To prevent the action of the masseter, intermaxillary wiring may be applied, but with a patient willing to lend his cooperation the mere instructions not to use solid food is sufficient. Where intermaxillary wiring becomes imperative the wires may be removed in ten days. The zygoma needs no special retention, as it holds itself in place after being pulled into position. No fear need be entertained when forcing the points of small tenaculum forceps into this region, as there are no vulnerable vessels or nerves immediately under the zygoma.

DELAYED UNION

Delayed union in fractures may be due to one of several reasons, principally, (1) improper reduction of the fracture; (2) insufficient rigidness in the immobilization; (3) broken-off roots and impacted teeth in line of fracture. These are the local causes. The systemic causes may be a deficiency in reparative qualities of the system or syphilis or other constitutional ailment. Contrary to popular belief, old age is not materially unkind to fractures of the jaws. Proper approximation and careful after-treatment are rewarded with success in these cases that is not unlike the success met with in young patients.

If a fracture has not united in six weeks the case may be placed in the class of *delayed union*. Some fractures will, however, go for three months before union is complete. If union is found to be progressing, it matters not how slow, it is best to allow more slack to the wires, as the slight sawing motion seems to stimulate healing. Delayed union is practically unheard of in the maxillae, and since the more extended use of the roentgen ray, delayed union even in

the mandible is rare, as the local causes above enumerated are detected before they exert their damaging influence.

If a fracture has gone over three months it may be classed as a case of *non union.* The diagnosis being self-evident; treatment consists of local and systemic measures. The local treatment embodies curretment, the use of thin files, and the general freshening of the fractured ends. In stubborn cases of non-union the wound must be exposed and a graft of bone inserted. (See page 133.) The general treatment consists of the eradication of any existing systemic disease and an attempt to build up the patient by the use of nutritious food, rest and tonics. It may not be out of place to say that delayed union of fractures and non-united fractures are becoming less encountered, due to better reduction and immobilization.

HEAD BANDAGES

As before pointed out (see Fractures of the Mandible) bandages are of little service except as temporary expedients. Bandaging,

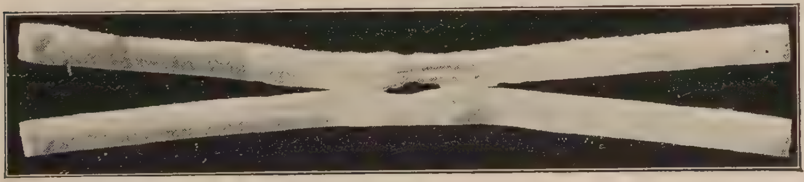


FIG. 110.—Four tailed bandage. Note slit in center (Foote, "A Textbook of Minor Surgery," Second Edition, D. Appleton & Co.).

however, is often necessary to hold dressings in place in extensive injuries of, or operations on, the jaws.

The four-tailed bandage is easily applied and consists of a piece of muslin 90 cm. long and 7½ cm. wide. The center of this bandage is slit, as shown in Fig. 110. The ends are then split almost to the central slit. The central portion of the muslin is then placed over the chin, permitting the latter to protrude. The two upper

ends or tails are carried backward underneath the ears and tied immediately under the occiput. The two lower ends are then brought up over the cheeks and tied together over the vertex. The four ends are then tied together in the midline (Fig. 111).

Barton's Bandage Is Applied as Follows.—A two inch gauze is used. "The bandage is started on the vertex at or in front of the

FIG. 111.—The final knot being tied in a fourtailed bandage. This exerts pressure upward and backward (Foote, "A Textbook of Minor Surgery," Second Edition, D. Appleton & Co.).

coronal suture, and carried downward behind the left ear, across the back of the neck, forward beneath the right ear, across the chin, and horizontally backward to the occiput. It is then carried upward behind the right ear to the starting point. From there it is carried downward in front of the left ear, across the cheek, under the chin, and upward in front of the right ear to the starting point (Fig. 112). The bandage is then carried over the existing twine

three times, to give it added security. Intersections of the bandage may be stitched or pinned."

Gibson's Bandage Is Applied as Follows.—"This is a bandage composed of three circles—a circle from beneath the chin to the vertex of the skull, an occipitofrontal circle, and a horizontal circle from the front of the chin to the back of the neck. The bandage is

FIG. 112.—Barton's bandage, with first layer completed. The roller is represented as just starting on the second layer (Foote, "A Textbook of Minor Surgery," Second Edition, D. Appleton & Co.).

started at the vertex at or in front of the coronal suture, and is carried in front of the ear, under the chin, and in front of the right ear and back to the starting point. Two additional turns are made directly over the first one. A fourth vertical turn is then started, but when it reaches the occipitofrontal circle the bandage is reversed (Fig. 113) and carried three times around this circle. A fourth horizontal turn is started, but when the bandage reaches the occiput it is carried forward below the right ear, across the front of

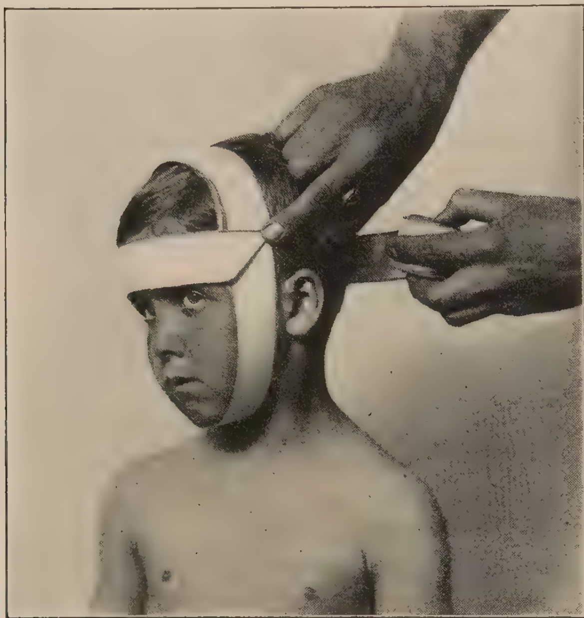


FIG. 113.—Gibson's bandage showing the first reverse (Foote, "A Textbook of Minor Surgery," Second Edition, D. Appleton & Co.).

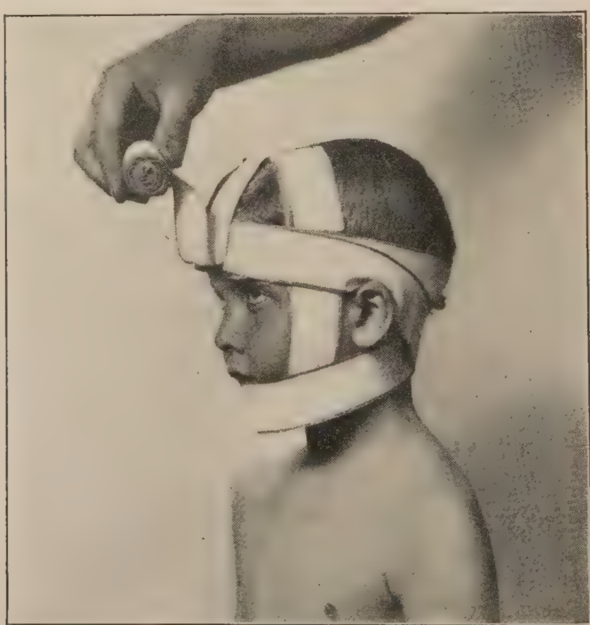


FIG. 114.—Gibson's bandage complete, except for pinning of the intersections (Foote, "A Textbook of Minor Surgery," Second Edition, D. Appleton & Co.).

the chin, and backward below the left ear to the occiput. Two additional turns of this character are applied. When it reaches the occiput, the bandage is reversed again and carried in the median line over the vertex of the skull to the forehead." (Fig. 114.) (Foote.) The extremity is then stitched or pinned. Adhesive tape may be used to retain all intersections and reversals. (See Fig. 94.)

CHAPTER XIV

TRIGEMINAL NEURALGIA

Synonyms.—Trifacial Neuralgia, Facial Neuralgia, Tic Douloureux, Fothergill's Disease, Neuralgia quinti major, Tic epileptiforme.

Definition.—An extremely painful affection of the trigeminal nerve.

This most excruciating of all pains has eluded all efforts of investigators to ascertain its etiology and pathology. At present, however, the symptoms, diagnosis, prognosis and treatment are comparatively settled.

Middle aged, and particularly people past middle age, are the only ones affected. There are only a few exceptions to this rule, and I have observed it in one instance in a young lady twenty-four years of age.

The symptoms are practically all subjective and the patients have almost a stereotyped way of expressing their justified complaints. In writing on this subject I quote freely from my article (published in the Journal American Medical Association, Dec. 3, 1921, V. 77).

"The etiology and pathology of trigeminal neuralgia are unknown. This statement applies to all that has ever been written on the subject. It includes (although I for several years believed the contrary) impacted teeth, abscessed teeth, teeth with pulp stones and teeth whose roots press on nerve trunks. Exostosed roots, jagged alveoli following extractions—in short, no dental disturbances seem to have any bearing either on the cause or treatment. I firmly believe that when the etiology is finally ascertained it will in some way be connected with the teeth, but at present

there is no justification for the imputation. Until then, it is well to bear in mind that, though an infected antrum or small cyst or other condition be present along with trigeminal neuralgia, the clearing up of the antrum or other condition, in whatever part of the body, will not in the least influence this dreadful malady, as they are merely coincidental. This opinion is shared by Harvey Cushing, Charles Frazier, Hugh Patrick and other men of experience. My reason for believing that the future may connect the teeth with the etiology of trigeminal neuralgia is based on the following: Is it not strange that out of all of the sensory nerves of the body the 5th pair of cranial nerves *alone* should be subject to this most painful of all maladies? Is it because of *all* sensory nerves, this nerve (the trigeminal) solely supplies the teeth? It is interesting to note that more than 98% of trigeminal neuralgias commence in the 2nd and 3rd divisions: Is it because the last division does not send branches to the teeth?

The symptoms are unmistakable in typical cases. The patient is usually of middle age or older; he complains of sharp, lancinating or severe burning flashes that radiate through some area supplied by the trigeminal nerve. If the subject has suffered for a year or more, he may have a premonitory aura not unlike that found in epileptics. When the paroxysm of pain strikes, there is a characteristic alteration of facial expression accompanied by a ghastly stare. He will explain that a tooth or other structure in the distribution of the trigeminal nerve, when touched, will yield this severe pain. Talking or laughing is likely to bring it on. Washing, rubbing, shaving, powdering, or bed clothes touching the area, is sufficient to elicit the pain. In fact, a draft of air, the alighting of a fly, may cause a paroxysm.

Oftentimes the affected area is caked with dirt because the toilet is carefully omitted in the affected zone. One characteristic, paramount above all, is that the patient will invariably state that the pain is the most excruciating of all pains. This includes any

injury he has received; acute appendicitis, renal colic or other pain."

Trigeminal neuralgia is a paroxysmal disease and, different from other forms of neuralgia, the pain is never continuous. In fact, the pains rarely last longer than one minute, with intervals

FIG. 115.—"Phantom" effect showing needle engaging mandibular nerve.

of complete relief for a moment or two in cases of long standing. In recently acquired cases, the pain may be absent for several days or weeks. The spontaneous permanent cure of trigeminal neuralgia has never been observed. Bilateral trigeminal neuralgia is very rare.

The prognosis for recent cases is good, as the treatment to be described, consisting of alcohol injections, is usually efficacious

for twelve months or more; in very old established cases, however, it may be necessary to resort to an intracranial operation.

The treatment consists of injecting the affected branch, or branches of the trigeminal nerve with 1 or 2 cc. of 95% alcohol.

FIG. 116.—"Phantom" effect showing the injection of the third division of the trigeminal nerve at the foramen ovale.

The branches most often affected are respectively as follows. The mandibular, infra-orbital, buccinator, supra-orbital, lingual, supratrochlear and auriculotemporal. To ascertain what branch

is affected, the examiner notes the area containing the "trigger zone." Patrick has so named the area that when touched or irritated produces a paroxysm. This in most cases is an easy pro-

FIG. 117.—"Phantom" effect showing injection of the second division of the trigeminal nerve at the foramen rotundum.

cedure, but in some cases, due to decussation of fibers, as in the buccinator nerve, the area may be only a mirrored one. I have termed this phenomenon a "mirrored trigger zone." Having ascertained the branch or branches, they are first blocked with 1

cc. of a 1% procain-epinephrin solution and then injected with from 1 to 2 cc. of 95% alcohol. As the technic for injecting alcohol does not differ from the conduction method of local anesthesia,

FIG. 118.—"Phantom" effect showing extra-oral injection of the infra-orbital nerve.

the reader is referred to works on that subject. For convenience, however, illustrations and concise legends are here shown depicting the most important injections (Figs. 115, 116, 117, 118 and 119). Some operators will not anesthetize either locally or with a general anesthetic, as they claim that the conscious patient is of help.

My experience is that the patient can be injected objectively therefore, I prefer a local or general anesthetic.

FIG. 119.—"Phantom" effect showing the injection of the buccinator nerve at the tip of the inner surface of the coronoid process. The needle is inserted through the outer cheek.

If the operator is thoroughly acquainted with the use of a syringe and able to visualize deep neuro-anatomy, he will find little difficulty in getting results. One or two failures, however, should not discourage one from further attempts. If unable, however, to

get results, the removal of the affected nerve is then justifiable. (See chapter on neurectomy.) As the usual case of trigeminal neuralgia recurs in from one to two years after injection, the injection should be repeated as needed. In some cases known as "major" types, which are characterized by having all three branches of the trigeminal affected, the section of the sensory root of the gasserian ganglion is the only effective means of relieving the patient. It must, however, be distinctly understood that alcoholization and simple neurectomies should be tried first, as sectioning of the sensory root of the gasserian ganglion is far from being a minor operation. While on this subject let it be understood that alcoholization and other treatments above mentioned will be of no benefit to neuralgias that are not typical cases of *tic douloureux.*

There are less severe types of neuralgia caused by pulp stones, exostosed roots, impacted teeth and eroded teeth, but in these cases extraction is all that is necessary to produce a cure. For more detailed information on pulp stones and other dental disorders, the reader is referred to works on operative dentistry.

NEURECTOMY

Definition.—The excision of a portion of a nerve. Known also as nerve trunk *avulsion.*

The only indication for neurectomy of the terminal branches of the trigeminal nerve is when alcoholization has failed. In the experienced hand, failures in alcohol injections are certainly very rare. At the outset let me say that there is no more excuse for making extra-oral incisions, when extirpating the infra-orbital, mandibular or lingual branches, than there would be for making an extra-oral incision to operate on an antrum. It is true that intra-oral incisions make the operation slightly more tedious but that, in itself, is hardly sufficient reason for producing disfiguring scars. Extra-oral incisions should be advocated only in cases of ankylosis or in other conditions that would prevent an open mouth.

To avulse the *infra-orbital* nerve, an intra-oral incision is made, extending from the median line to about the first molar. This incision is directed to the bone and is placed just above the apices of the teeth. The lip is then everted and the wound retracted by the assistant. A periosteal elevator lifts off all of the tissues,

FIG. 120.—Intra-oral removal of infra-orbital nerve.

including the periosteum, the operator working his way towards the infra-orbital ridge. About 6 mm. below the infra-orbital ridge, and in line with the upper premolar teeth, the nerve will be easily identified as it emerges from the infra-orbital foramen. If neurectomies are done under a local anesthetic, hemorrhage will not interfere with a good view of the field. If done under a general,

it is wise to inject 5 cc. of a physiologic salt solution to which has been added 5 to 10 drops of epinephrin. This should, of course, be injected into the field about to be invaded. Hemorrhage thus being controlled, no attempt is made to ligate the infra-orbital artery, as it rarely gives any secondary trouble. Should hemorrhage be troublesome, an iodoform gauze pack will readily control it. The nerve is grasped with a strong pair of hemostats and is pulled out of the foramen about 3 mm. By alternately twisting the nerve (thus breaking its attachment to the sides of the canal) and pulling it, 1 to 3 mm., a good portion of the trunk will be avulsed. Every time a portion has been pulled out, the hemostats are made to get a new hold as near the foramen as possible (Fig. 120). Finally the nerve breaks; by still holding to the trunk, the branches known as palpebral, nasal and labial, are followed with the periosteal elevator and as the nerve tissue is resistant to instrumentation, the muscular tissue is easily separated from the nerves. By alternately twisting and pulling, the nerve is torn from its palpebral, nasal and labial attachments, and the wound closed with two or three stitches. If hemorrhage has been annoying, the wound may be comfortably packed with 5% iodoform gauze. The gauze may be removed in forty-eight hours, and if bleeding has been controlled, no further dressing is to be used. The patient is instructed to use a mouthwash and is warned against the use of a tooth-brush on the operated side, while the tissues are still unhealed.

AVULSION OF THE MANDIBULAR NERVE

The *mandibular* nerve may be removed intra-orally at two points (1) at the mental foramen (2) at the mandibular foramen. To expose the region of the mental foramen, an incision is made extending from the lateral incisor almost to the second molar. Care is taken to make the incision not lower than about *midway* of the roots of the teeth. If the incision is made directly at the

apices of the premolars, the knife, which is carried directly to the bone, might section the nerve. The tissues are then elevated from the bone and retracted downwards. The nerve is then grasped

FIG. 121.—Removing the mandibular nerve at the mental foramen.

with the hemostats and the operation proceeds as described for the removal of the infra-orbital nerve (Fig. 121). However, unlike the infra-orbital foramen, the mental foramen is rather tortuous and often requires enlarging in a posterior direction, in

order to facilitate pulling the nerve out of the canal. Brophy's large barbed broach (Fig. 122) is then inserted and as much of the

FIG. 122.—Flexible, barbed broach for removing mandibular nerve (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

FIG. 123.—Avulsion of the mandibular nerve on the inner surface of the ascending ramus.

nerve tissue removed as can be accomplished. No attention need be paid to the artery, as hemorrhage is never an alarming factor.

In the past, silver screws, gutta-percha and other materials were used to occlude a portion of the mandibular canal but such procedures have not met with the success hoped for. The wound is simply sutured with three or four catgut stitches, or it may be dressed with a 5% iodoform gauze.

The other intra-oral approach to the mandibular nerve is accomplished by making a vertical incision along the anterior border of the ascending ramus, commencing at the tip of the coronoid process and extending downwards just behind the third molar. The tissues are then easily retracted from the inner surface of the ascending ramus (Fig. 123). An epinephrin solution, as advocated for removal of the infra-orbital nerve, is of great value in making the field visible. About 10 mm. above the masticating surfaces of the lower molars, the nerve is identified, as it enters the mandibular foramen. The hemostats secure a good hold and the nerve is pulled in a *downward* direction. As the nerve stretches, a higher hold is secured until the nerve finally breaks. The hold is continued on the distal portion of the nerve and is then pulled *upward*. Thus, a good portion of the nerve is removed from the canal. If hemorrhage is not profuse, the wound is closed with about three catgut sutures, otherwise a 5% iodoform gauze dressing is firmly inserted. At the end of a week, dressings may be discontinued.

AVULSION OF THE LINGUAL NERVE

The *lingual* nerve may also be removed through the same approach as just described for the removal of the mandibular nerve on the inner surface of the ascending ramus, or it may be removed after it enters the tongue. If the tongue is grasped with the tongue-forceps and turned over as much as possible, the lingual nerve is often seen as a glistening elevation. The mucous membrane over it is incised and as much of the nerve removed as possible. Alcohol injected into this portion of the lingual nerve is, however, to be preferred to avulsion.

It must be distinctly understood that neurectomies, like alcohol injections, are not permanently effective; in fact, only the carefully executed operation on the gasserian ganglion can be considered as a permanent cure. It is agreed, however, among oral surgeons and neuro-surgeons, that gasserectomies are not to be resorted to excepting as a last measure. I have noticed among my patients who are of the medical or dental professions, that intracranial operations are not at all preferred to the other less formidable operations. In this connection I repeat what I have previously pointed out; intracranial operations are not as fraught with danger as is commonly supposed. Tables covering hundreds of cases show only a 2% mortality. This is, of course, an improvement on the mortality rates of earlier days. Disconcerting remarks about these operations should not be made, as the patient who is beyond relief from the simpler measures may be frightened away from the relief offered by a competent neuro-surgeon.

CHAPTER XV

REMOVAL OF BROKEN NEEDLES

The popularity that local anesthesia justly enjoys has brought about a number of accidents among which the breakage of needles is occasionally met with. The mandibular region seems to lead in point of frequency as a site for this accident, followed by the region of the tuberosity. Only one case of a broken needle in the infra-orbital injection has ever been referred to the writer.

Strange as it may seem, needles that are broken off in the above named regions do not cause any discomfort. The writer has kept a record for years of a number of cases referred from the college clinics and in *no instance* are the patients suffering as a result of the accident. This statement is not intended to convey the impression that one should be otherwise than careful, but it is nevertheless true that a broken off sterile needle will rarely ever trouble the patient.

If it becomes necessary to remove a needle in the region of the mandibular foramen, it is best to first obtain a lateral roentgeno-gram (Fig. 124). An incision for the purpose of removing a needle should always *bisect* it (the needle). Hemorrhage should be controlled by injecting 5 to 10 drops of epinephrin to 5 cc. of a saline solution. The field is thus made practically bloodless. See Figs. 123 and 125 for a general understanding of the approach made in order to expose the broken off needle.

The tissues should be compressed between the two index fingers with the hope of locating the needle. Once the needle is found, either by the eye or finger, this advantage should not be relinquished. A pair of hemostats grasps the needle and overlying tissues, if unavoidable, and the needle is then pulled forward with

a jerking motion. This causes the broken end to pierce the tissues which is then grasped with another pair of forceps and removed. The glistening of the tendons in this region often simulates a metallic sheen and therefore a lot of time may be consumed in following

FIG. 124.—Arrow points to broken needle on inner surface of ascending ramus.

wrong leads. Though it would appear that this operation is very easy of accomplishment, in practice the converse is the rule. Oftentimes an hour or more is consumed in removing a broken needle. The wound may be dressed with iodoform gauze and the dressing changed every 48 hours for a period of about a week.

In order to remove a needle that has been broken off in the region of the tuberosity, an incision as shown in Fig. 184 is made. The hemorrhage should be controlled as above mentioned and the tissues retracted as shown in Fig. 186*A*. By placing one index finger in the wound and the other index finger high in the fornix the tissues are compressed. This will, as a rule, disclose the needle. Once the needle is felt, a pair of hemostats grasp the needle and overlying tissues and by pulling downward the needle is made to

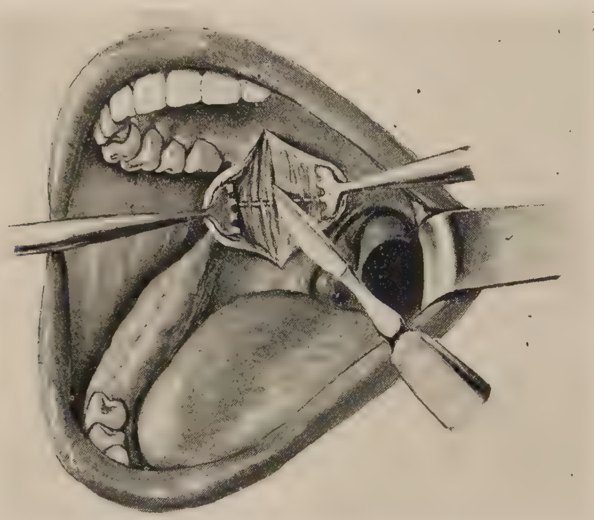


Fig. 125.—Illustrates the line of incision to be made on the inner surface of the ascending ramus. The soft tissues are carefully dissected until the needle is exposed (Berger, "Technic of Oral Surgery").

pierce any tissue covering it. As described above, another pair of hemostats grasp the protruding portion and the operation is complete.

Prevention of needle breaking is perhaps an interesting subject in this connection. Sometimes a needle breaks, because of a defect in it, sometimes the break is due to faulty technic. After a number of needles had been broken by students, the writer suggested that no needle should be inserted with less than 5 mm. exposed to view. Under no circumstances should a needle

be inserted up to its shoulder. When a needle breaks it is always at the point touching the shoulder, as this is the pivotal point. Therefore, if 5 mm. are always left exposed the needle can always be grasped with a pair of forceps or pliers. Needles of proper lengths are now available to enable one to observe the above precaution It is interesting to know that out of more than 300 dental and medical undergraduates taught by the author during the last two years, only one needle was broken off in the tissues. In previous years the percentage was alarmingly high.

CHAPTER XVI

BELL'S PALSY (BELL'S PARALYSIS)

Definition.—Paralysis of the facial muscles.

Bell's palsy may result from accidental or surgical injuries to the facial nerve, or it may occur following a cold, or middle-ear affection.

The diagnosis is not difficult. The patient is incapable of voluntary or emotional movement of the affected side of the face.

Fig. 126.—Left sided Bell's palsy. An attempt to close the eyes and retract angles of mouth (Purves Stewart, "The Diagnoses of Nervous Diseases").

All wrinkles are obliterated, the patient cannot close his eye nor pucker his lips (Fig. 126). Smiling is possible only on the unaffected side. The eye should be protected from flying foreign particles as the lid cannot be closed. A strange phenomenon is observed in patients affected with Bell's palsy; though the eye can not voluntarily be closed during waking hours, it often closes during sleep,

probably due to the drooping of the relaxed upper lid. Owing to the paralyzation of the buccinator muscle, food collects between the cheek and buccal side of the teeth, necessating digital removal. Patients should be unusually careful about brushing the teeth on the affected side so as to prevent damage. Bilateral cases of Bell's Palsy though rare are occasionally seen (Fig. 127).

The prognosis is always good excepting where a complete section of the nerve has occurred. All sudden onsets, without history of

Fig. 127.—Maximum voluntary movement of face on attempting to close the eyes and to retract angles of the mouth in a case of bilateral Bell's palsy (Purves Stewart, "The Diagnoses of Nervous Diseases").

trauma or malignancy, will nearly always spontaneously correct themselves within a few days. Sometimes it will require from one week to several months before a complete restoration of function is established.

The average case of Bell's palsy does not need treatment, as a return to normal is effected by merely treating the patient for whatever may have been a contributing cause. The teeth should receive careful attention, as reflex irritation may contribute to this condition. Syphilis should be eliminated as a probable cause.

The galvanic current has been employed with varying degrees of success. If the paralysis persists for a long time without improvement, the affected facial nerve may be anastomosed with either the spinal accessory or hypoglossal nerves to restore function. The neuro-surgeons who have performed this operation claim a fair percentage of success.

CHAPTER XVII

IRREGULARITIES OF THE TEETH AND JAWS

Definition.—Faulty relation between the opposing teeth or jaws.

Fig. 128.—Patient with class III malocclusion (C. C. Howard).

Fig. 129.—Same as Fig. 128 after orthodontic correction (C. C. Howard).

The orthodontist is well able to cope with irregularities of the teeth or jaws, as is well illustrated in Figs. 128, 129, 130 and 131

and no surgeon should attempt to surgically correct a dento-facial deformity, unless a skilled orthodontist advises it. In children, and even in youths, the orthodontist will rarely be otherwise than helpful to patients with irregularities of the jaws. In older patients the surgeon can be of service, but unless he is himself trained in orthodontia he should co-operate with an orthodontist, otherwise he will not meet with success. At the most, no surgeon will promise more than once a great deal of improvement, as his

Fig. 130.—Patient with class II malocclusion (C. C. Howard).

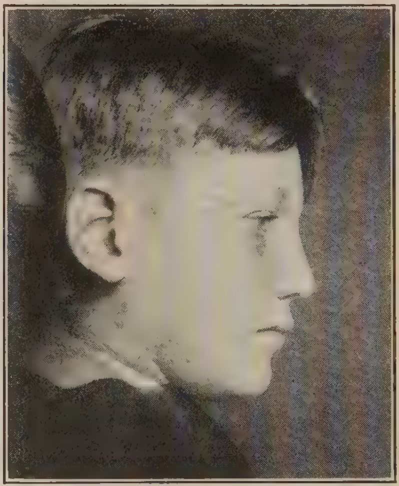


Fig. 131.—Same as Fig. 130 after orthodontic correction (C. C. Howard).

first experience of non-union of the sectional jaws, troublesome infections, or persistent sinuses, will, no doubt, moderate his enthusiasm. A patient who is not warned as to probable infection will try the patience of the surgeon during the healing period.

The two principal deformities, which may be classed as belonging to the surgeon, are those occurring in adults and known to the orthodontist as class II and class III. One is a retruding and the other is a protruding mandible.

Blair has described an operation for both of these conditions that far excels those previously employed. In operating on a

retracted mandible he makes an incision two cm. in length at the posterior border of the ascending ramus (Fig. 132). The skin is retracted forward and the parotid gland backward. Care must be taken not to injure the cervicofacial branches of the facial

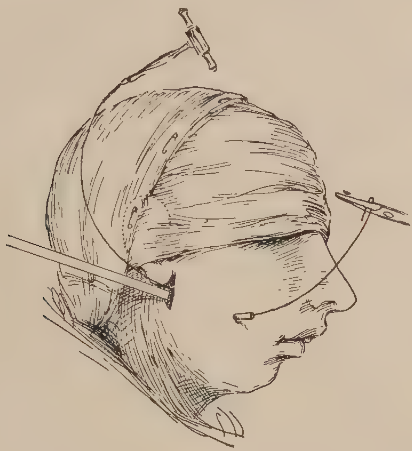


FIG. 132.—Subcutaneous section of the ramus showing points of entrance and exit of the Gigli saw (Blair, "Surgical Diseases of the Mouth and Jaws").

nerve. A needle, as shown in Fig. 133 is used to pilot the Gigli saw. The needle must hug close to the inner surface of the ascending ramus and must not be allowed to enter the buccal cavity. The Gigli saw must be held as straight as possible, with but little

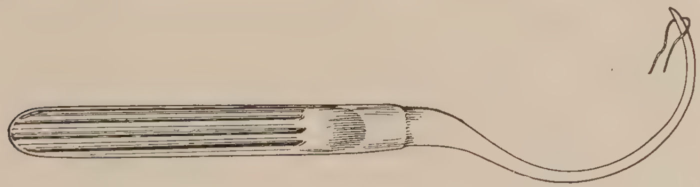


FIG. 133.—Full curved needle used for passing pilot carrier around ramus (Blair, "Surgica Diseases of the Mouth and Jaws").

traction outward, or else, the overlying soft tissues will be severed. This operation is completed on both right and left rami, the jaw pulled forward to its proper place and the intermaxillary wires which have previously been placed are then twisted together. (See page 124.)

For protrusion of the mandible Blair advises the extraction of the first premolar tooth, right and left, and after waiting a month or six weeks for healing of the gums, the operation may proceed by making extra-oral incisions about three cm. in length along the lower border of the mandible. The incisions are long enough to permit easy retraction of the tissues in order that sections, as illustrated in Fig. 134 may be removed on both sides of the mandible. The attempt to remove these sections without entering the buccal cavity is attended with much difficulty. Prior to cutting or sawing the section of bone, drill-holes are made (as

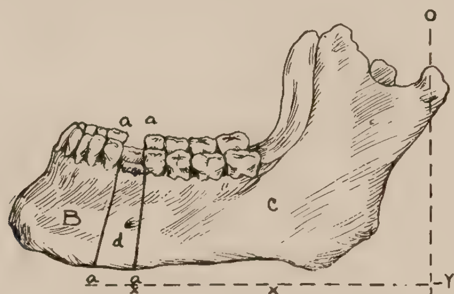


FIG. 134.—Vertical lines show section to be removed (Blair, "Surgical Diseases of the Mouth and Jaws").

described in the chapter on Fractures of Edentulous Jaws) as the ends of the bone must be wired with silver wires; this is, of course, in addition to intermaxillary wiring. If a sufficient number of intermaxillary wires are used, which would mean more wires than are used in the ordinary fractured mandible, the use of especially made splints are not necessary. No concern is to be felt regarding the severed mandibular nerve or artery. Should hemorrhage be profuse, in the operation described above for retrusion of the mandible, the wound may be packed with an iodoform gauze strip which is to be removed in two or three days. If done under procain-epinephrin anesthesia, the field of operation is better seen than when done under a general anesthetic.

CHAPTER XVIII

PLASTIC SURGERY

Definition.—Restoration of misplaced or lost soft tissues, by transfer of neighboring tissues or grafts from remote parts.

There are certain terms used in plastic surgery which, for the benefit of the student, are here briefly defined.

Stomaplasty—plastic operations on the mouth.

Cheiloplasty—plastic operations on the lips.

Meloplasty—plastic operations on the cheek.

Rhinoplasty—plastic operations on the nose.

In civil and military practice, patients often present themselves with conditions requiring surgical intervention for cosmetic reasons. Fast rules are rarely applicable to any branch of surgery and are particularly of little use in plastic surgery. In order, however, to get the best results from plastic operations, the surgeon must remember one important rule; wherever he finds loss of soft tissue complicated with loss of the underlying skeleton, the latter must first be corrected. Lost teeth or bone must first be restored, either surgically or with prosthesis, or else the plastic interference will fail. In other words, without proper foundation, no construction is possible, or rather, feasible. Most medical and dental men now know what was known to but very few prior to the world war, that without the ingenious temporary appliances used in maxillo-facial injuries, the contraction of tissues and aggravating scars would have made impossible the good results now obtained. Often times war injuries were so extensive that no degree of plastic skill alone would have obtained the results shown in Figs. 135, 136 and 137. Lost or misplaced soft tissues of the face without loss of the underlying bone can be corrected either by the sliding of the immediate tissues (Figs. 138, 139 and 140) or by a pedicled flap (Fig. 141).

FIG. 135.—Gun shot wound of face and upper jaw (Kazanjian).

FIG. 136.—Same as Fig. 135 with prosthetic appliance replacing lost maxillae (Kazanjian).

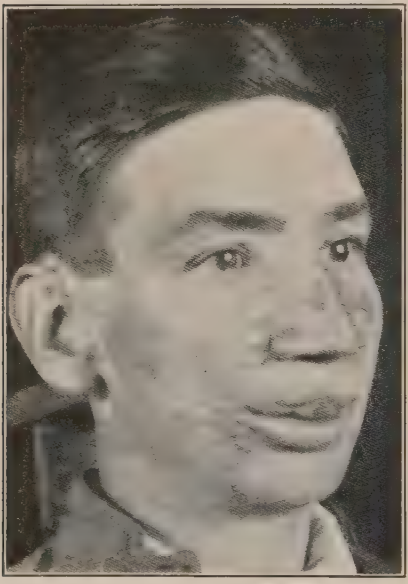


FIG. 137.—Same as Figs. 135 and 136 after reconstruction of lip (Kazanjian).

FIG. 138.—Loss of portion of mandible and overlying soft tissues (Kazanjian).

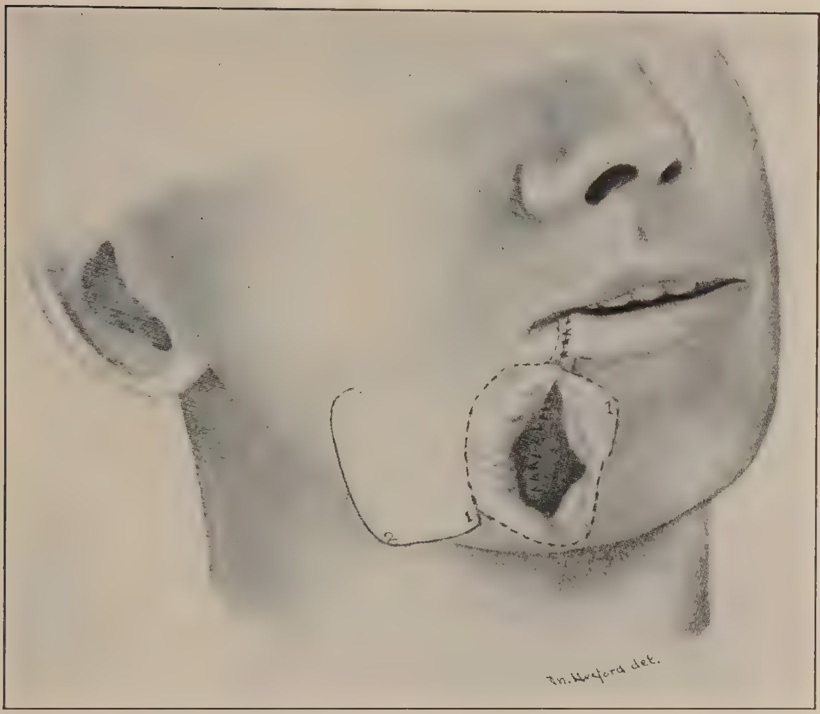


FIG. 139.—Drawing showing outline of flap (Kazanjian).

FIG. 140.—Same as Figs. 138 and 139 after healing of flap (Kazanjian).

John B. Roberts, in substance, gives the following succinct rules for the guidance of plastic surgeons: All fibrous tissue must

FIG. 141.—Pedicled flap from neck to repair defect in cheek. Due to shrinkage flaps should be larger than the area to be corrected.

be removed, bleeding must be arrested, parts must be sutured without tension and covered with aseptic gauze. Some cases may

need a series of operations extending over a period of several months, therefore do not attempt too much at once; allow ample time between operations to take care of contractions. Roberts advises making cutaneous flaps with pedicles, large and thick. Incorporate artery and vein in flap if possible. Subcutaneous fascia must be included. Because skin is elastic make flap 30 to 40% larger than area to be covered. The flap is not

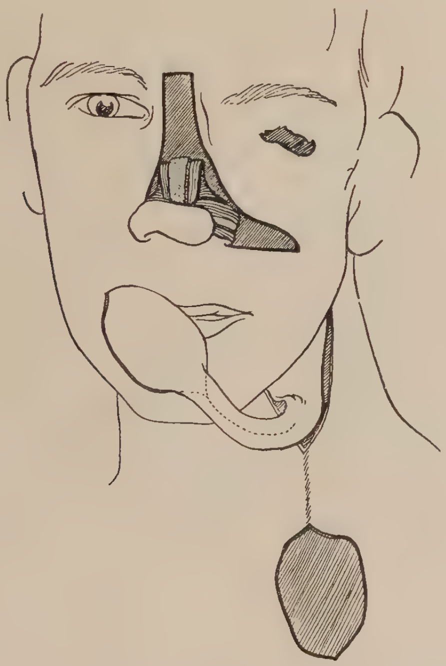


FIG. 142.—Tube-pedicle chest flap is represented on its way to the nose defect (Gillies "Plastic Surgery of the Face").

to be twisted too much as it may cut off arterial supply. Should the flap, within three or four days, become grayish, pulpy, or show loosened cuticle, venous gangrene is probable and should be treated by puncturing the flap in several places to lessen venous engorgement. Should the flap, during the same period, become whitish, then dark and withered, arterial gangrene is imminent and should be treated by removing all, or nearly all, of the stitches. Flaps that have persisted for four days or more are practically assured of

taking. Pedicled flaps are to be preferred to grafts wherever possible. The "tubed" pedicled graft of Gillies was particularly successful during the World War (Figs. 142 and 143).

Raw surfaces should never be turned towards the oral cavity. By turning the cutaneous surface towards the mouth the chances for success are good. The Ollier-Thiersch (skin) graft is used to cover the exposed raw surface at a later period.

FIG. 143.—Rhinoplasty from chest (Gillies, "Plastic Surgery of the Face").

The Italian method of rhinoplasty, namely, taking the flap from the arm, which necessitates the fixing of the patient's arm firmly in front of the face by suitable apparatus and bandages, until the flap takes, has been found less practical than the more recent methods, which are, to say the least, more comfortable to the patient (See Figs. 142 and 143.)

ESSER'S EPITHELIAL INLAY

Oftentimes, owing to loss of mucous membrane and other soft tissues within the mouth, the natural buccal and labial folds will be

obliterated. In order to reestablish the normal depth of the folds, Esser has suggested the operation shown in Fig. 144. The inci-

FIG. 144.—1. The obliterated sulcus. 2. Incision close to bone. 3. Sulcus deepened. 4. Skin graft on modelling compound. 5. Graft in position. 6. Splint with adjustable flange. 7. Flange holding modelling compound and graft in place. 8. Sulcus restored. (Gillies).

sion through the soft tissues is made as close to the bone as possible, the sulcus is then deepened to correspond with the normal side.

Prior to this operation the prosthetist should have made a splint to which is fitted an adjustable flange. The fresh wound is packed with warm modeling compound, which after being chilled is removed. A skin graft of suitable size is then spread (deep surface outward) over the compound and carried to place. The adjustable flange engages the compound, thus securing the skin graft in place. After ten days the appliance is removed and the sulcus is found to be permanent with but little tendency to become shallow. Esser's epithelial inlay is also of value in lining the orbit after the loss of an eye. Prosthetic appliances are not especially irritating, if they have been properly constructed and fitted.

CHAPTER XIX

MAXILLO-FACIAL PROSTHESIS

Definition.—The supplying of a missing part by artificial means.

In extensive maxillo-facial injuries or diseases the plastic surgeon will find himself helpless, unless a dental prosthetist is at hand for the construction of either temporary or permanent prosthesis.

FIG. 145.—Part of mandible replaced by vulcanite and retained by removable bridge attachments (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

No attempt will here be made to describe in detail the construction of various prosthetic appliances, as this is well handled in books on that subject. It must not be thought that prosthesis is a World War product, though no doubt, the unusual

opportunities it gave resulted in great advances being made in the art. For more than a century prosthesis has been employed in cases

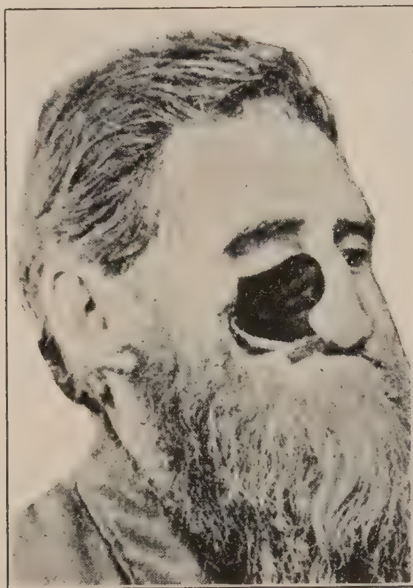


Fig. 146.—Loss of right maxilla and overlying soft tissues (Thos. P. Hinman, *Dental Cosmos*, June, 1896).

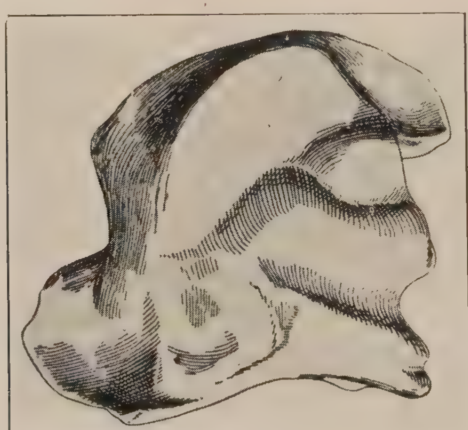


Fig. 147.—Prosthetic appliance of aluminum constructed by Dr. Thos. P. Hinman in 1896 for patient shown in Fig. 146).

needing artificial restorations. The accompanying illustrated cases, where prosthesis has been employed, are presented in order

to show how prosthesis benefits the patients, who are beyond the aid of plastic surgery. Figure 145 shows appliance used to replace

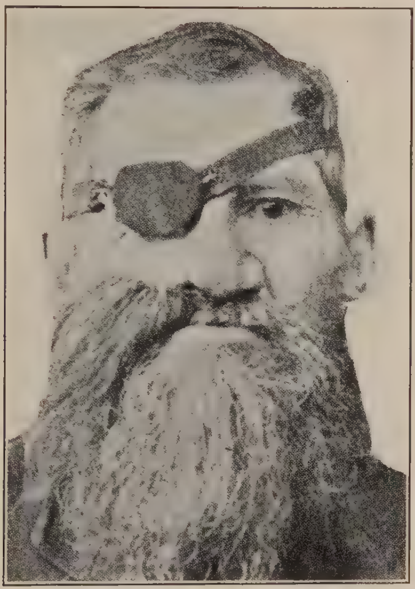


FIG. 148.—Same as Fig. 146 after outer prosthesis had been painted to simulate the surrounding tissues (Thos. P. Hinman).

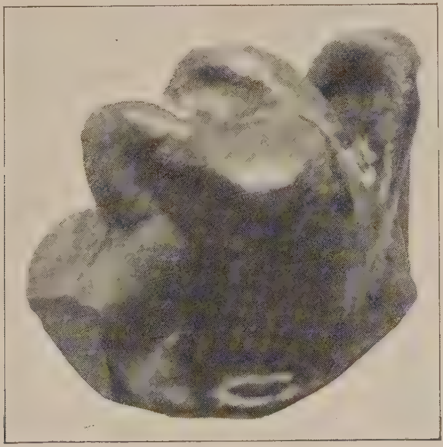


FIG. 149.—Artificial restoration of maxillae with attachments underneath for full denture.

the horizontal and ascending rami of the right side. Figures 146, 147 and 148 show replacement of the right maxilla and associate

parts. Figures 149, 150, 151 and 152 show appliances and results following the loss of both maxillae. (See also Fig. 105.) Where

FIG. 150.—Same as Fig. 149 with full upper denture.

FIG. 151.—Same as Fig. 105 after healing but before prosthetic restoration.

destruction has been too widespread, the construction of a mask, as shown in Figs. 153, 154 and 155 offers the only means of hiding

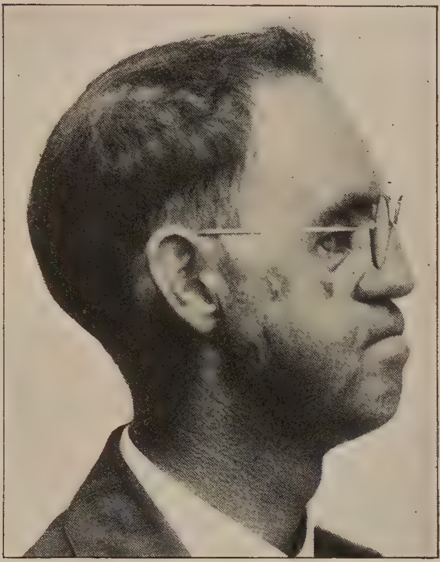


FIG. 152.—Same as Fig. 151 after insertion of appliance shown in Fig. 150.

FIG. 153.—Shows mutilated facial appearance (Ladd).

FIG. 154.—Same as Fig. 153 with mask reproducing patient's former appearance (Ladd).

FIG. 155.—Mrs. Ladd putting finishing touches on "reconstructed mask." Photographs of patient prior to injury are used as working models.

A B

FIG. 156*A*.—Destruction of anterior part of nose.
FIG. 156*B*.—Prosthetic restoration of nose attached to spectacles (Kazanjian).

the multilations. It should be noted that neither surgery alone, nor prosthesis alone, can produce the best results. Kazanjian speaking of mutilating jaw injuries received during the World War has well summed up this question: "For the treatment of such deformities, we must resort to either surgery or prosthesis and, in some instances, combinations of the two. Although the two methods have been developed independent of each other, one by surgeons, the other by dentists, we must not consider them as separate schools discussing the relative merits of one against the other. Rather must we consider that we have two sources from

FIG. 157.—Prosthesis to replace loss of left maxilla (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

which we hope to secure help for the unfortunate patient, the relative merit of each being dependent on the circumstances and peculiarities of each individual case."

The materials used in prosthetic restorations usually consist of gold, porcelain, rubber or gelatin. To retain the various intra-oral appliances, the teeth offer substantial anchorage. Spectacles are also used for retention purposes (Fig. 156*A* and *B*). Extensions into the nose and antra may be utilized to retain appliances (Fig. 157). Various glues may be used. Wherever possible, rigidity

of the appliance is the desideratum. It follows then, that the ultimate success depends upon the ingenuity of the prosthetist. Sufficient examples of cases are here shown to illustrate what may be accomplished by resourcefulness.

CHAPTER XX

ALVEOLECTOMY

Definition—The operation of excising or cutting away any portion of the alveolar process.

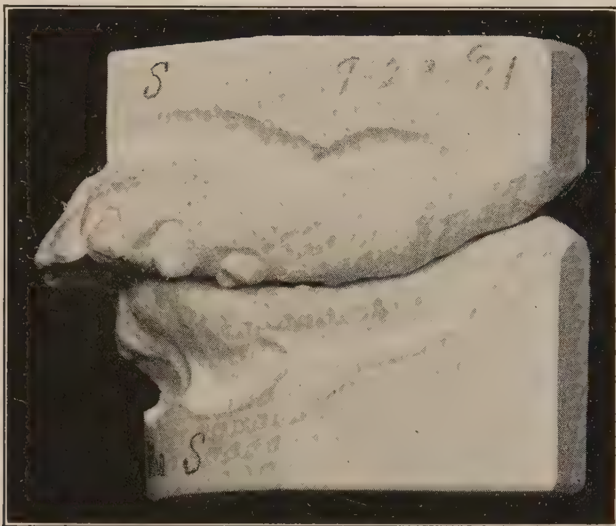
The condition requiring alveolectomy is known as *hyperostosis* or *exostosis* and is characterized by hypertrophy of the alveolar process. The gum tissue, too, is as a rule hypertrophied. The hypertrophy may be confined to certain parts of the maxillae or mandible, or may be general. Figure 158*A*, *B*, *C*, *D* and *E* show a case of general alveolar hypertrophy and the results obtained with a combination of alveolectomy and upper and lower full dentures.

If the teeth are in normal position, it is not necessary to extract them, as the alveolar process can be removed without disturbing the teeth.

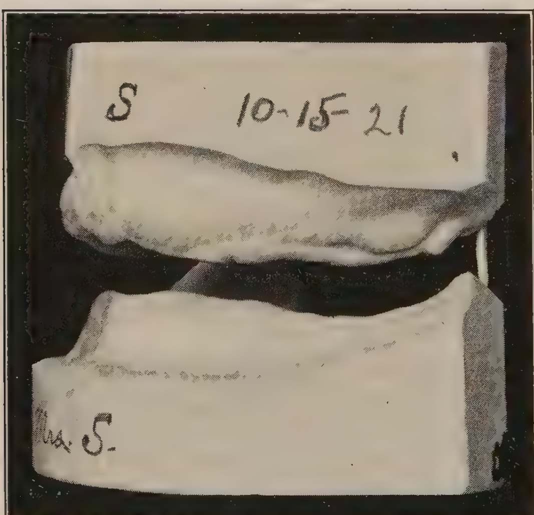
The average case, however, is not seen by the oral surgeon until the patient is either partially or totally edentulous.

The indications for alveolectomy are for the correction of a deformity, as shown above (Fig. 158*A*) and for improving the arches for the reception of artificial dentures. Care must be exercised in order to remove only that portion of the hypertrophy as would tend to interfere with a proper fit of the denture. To the experienced operator it is an easy matter to visualize what the possibilities are in a given case of bony hypertrophy. To remove too much of the osseous structure will result in flattened arches for which the prosthetist can do but little.

The sites most often affected by these osseous excrescences are, respectively, the alveolar processes of the maxillae, the mandibular alveolar process, particularly in the anterior region, the center of the hard palate (Fig. 159) and on the lingual surface of the man-



A



B

Fig. 158*A*–*B*.—Showing hypertrophy of alveolar ridges. *B*, result after operation of alveolectomy (Menifee R. Howard).

FIG. 158*C*.—Front view of patient. Same as Fig. 158*A*.

FIG. 158*D*.—Same as Fig. 158*C* following alveolectomy.

FIG. 158*E*.—After alveolectomy and prosthetic restoration (Menifee R. Howard).

Fig. 159.—Hypertrophy in dome of hard palate and proper incision for its removal (see text).

Fig. 160.—Incision for alveolectomy in anterior region of the maxillae.

dible in the region below the first premolars. The last named rarely needs treatment as the excrescences are usually at a lower level than the rim of the mandibular denture can reach. Unless the excrescences in the center of the palate are likely to interfere with the comfortable wearing of a denture, they should be unmolested,

Fig. 161.—Flap everted.

as no pathology has ever been found in connection with them, excepting as a secondary condition arising from constant irritation.

In order to remove this excrescence, it is best to avoid a median incision, for should one be so unfortunate as to perforate into the nose, a permanent nasal opening is likely to result. The proper incision and one that will obviate a nasal opening is illustrated in

Fig. 159. The bony tissue is removed with suitable Rongeur forceps, the flap is returned and the wound closed with fine black silk; horsehair may be used but is not as well tolerated by the tongue. The stitches may be removed at the end of three days.

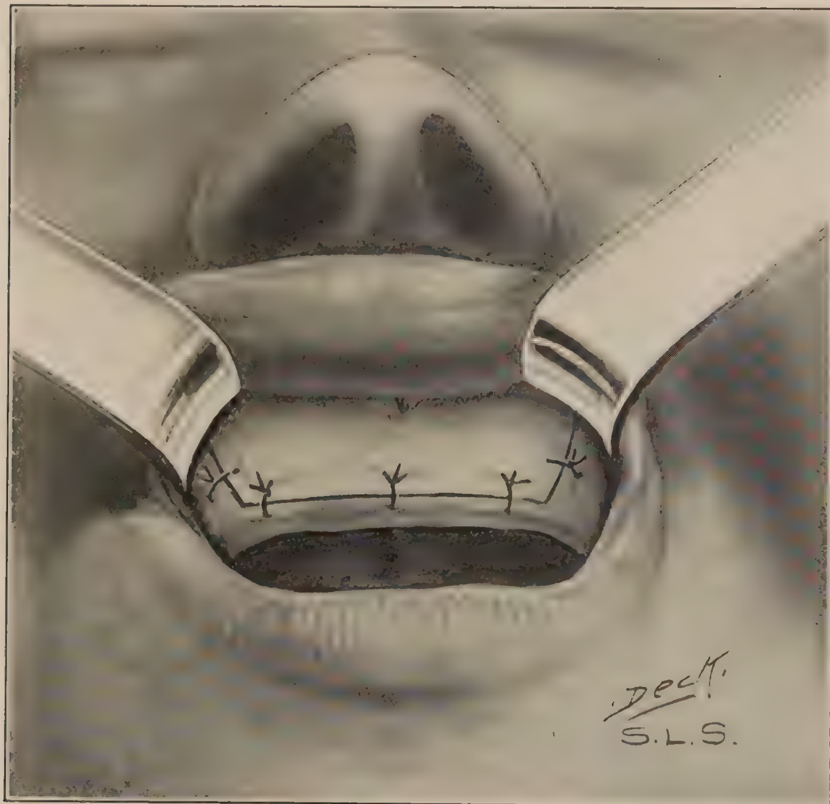


Fig. 162.—Flap returned to position and sutured.

To remove an alveolar hyperostosis of the maxillae or mandible, two vertical incisions are made on either extremity of the hyperostosis, and these vertical incisions are then connected with an occlusal incision (Fig. 160). The mucoperiosteum is then lifted by blunt dissection and everted precisely as it were the lip (Fig. 161). The excrescences being removed, the mucoperiosteum is then returned. If a superfluity of gum tissue exists, it is trimmed

off and the wound closed either with fine catgut, black silk or horsehair (Fig. 162). The stitches may be removed in four or five days and a temporary denture inserted. If the removal of the bony excrescences has been complete by the use of Rongeur forceps, chisels and finally, by a file, no fear need be entertained concerning a recurrence. In alveolectomy, as in many other operations about the oral cavity, local anesthesia is the procedure of choice. Should general anesthesia be employed, the injection of five to ten drops of epinephrin to 10 c.c. of a saline solution in the immediate field will effectually control hemorrhage.

CHAPTER XXI

PERICEMENTOMA

Synonyms. Granuloma, Blind Abscess.

Definition.—A non-fistulous rarefaction of the apical osseous structure replaced with granulating tissue.

The laity have so popularized this condition as "blind abscess" that, as in the case of their popularization of the term "tic douloureux," it is difficult to ignore it. Apical pericementomas can be discerned only by the use of the roentgen ray. If digital pressure can detect an apical rarefaction, it means more of a cystic condition than the typical granuloma or pericementoma with which we are dealing; and as a rule will be found to involve more than a single tooth.

Apical rarefaction usually results from an insiduous destruction which carries with it no subjective or objective symptoms. Or, it may be preceded by an acute stage. Any devitalized tooth may be the seat of a pericementoma. Since there are no subjective symptoms it would indeed be folly to take operative measures for their eradication, were it not for the fact that these conditions seem to be foci of infection. There is no doubt in the author's mind that these dormant infections are contributing factors to general disease. Even in the absence of secondary infection, it is a wise procedure to ionize these conditions, when they happen to be found during a general roentgen ray examination. I do not, however, advocate ionization where a secondary disease is present.

There are three methods in vogue in the treatment of apical pericementomas, namely; ionization, extraction and apicoectomy. As the first two methods mentioned are well described in works on operative dentistry, it remains that apicoectomy be here described.

APICOECTOMY

Synonyms.—Root Amputation, Root Resection, Apiectomy.

Definition.—The excision or amputation of the apex of a tooth-root.

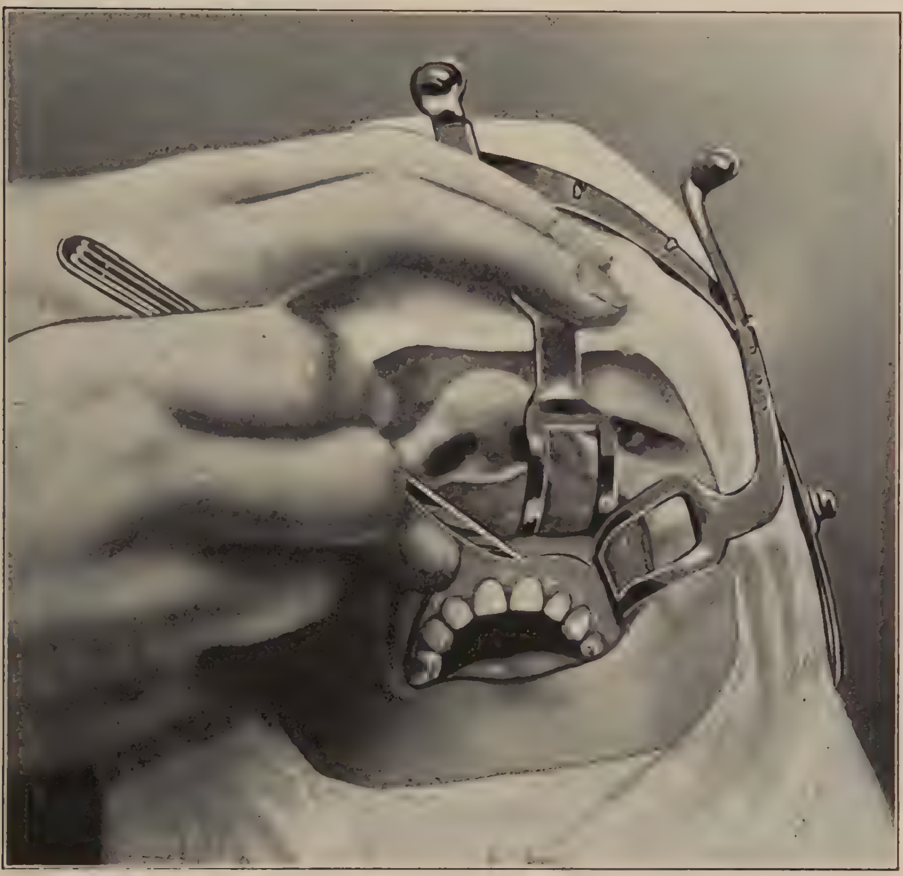


FIG. 163.—Incision for apicoectomy.

The operation of apicoectomy should never be performed unless conditions are most ideal and promising. If the pericementoma extends over more than one third of the root the condition is not ideal and should not be operated upon. I realize that there are exceptions to this rule. After having seen so many failures con-

nected with apicoectomy, I have come to the conclusion that by far the greatest cause of these failures is a disregard of the extent of the disease. If the root-canal filling is not properly done prior to the operation, failure will result. Other causes of failure are; operations upon teeth affected with peridontoclasia (pyorrhea

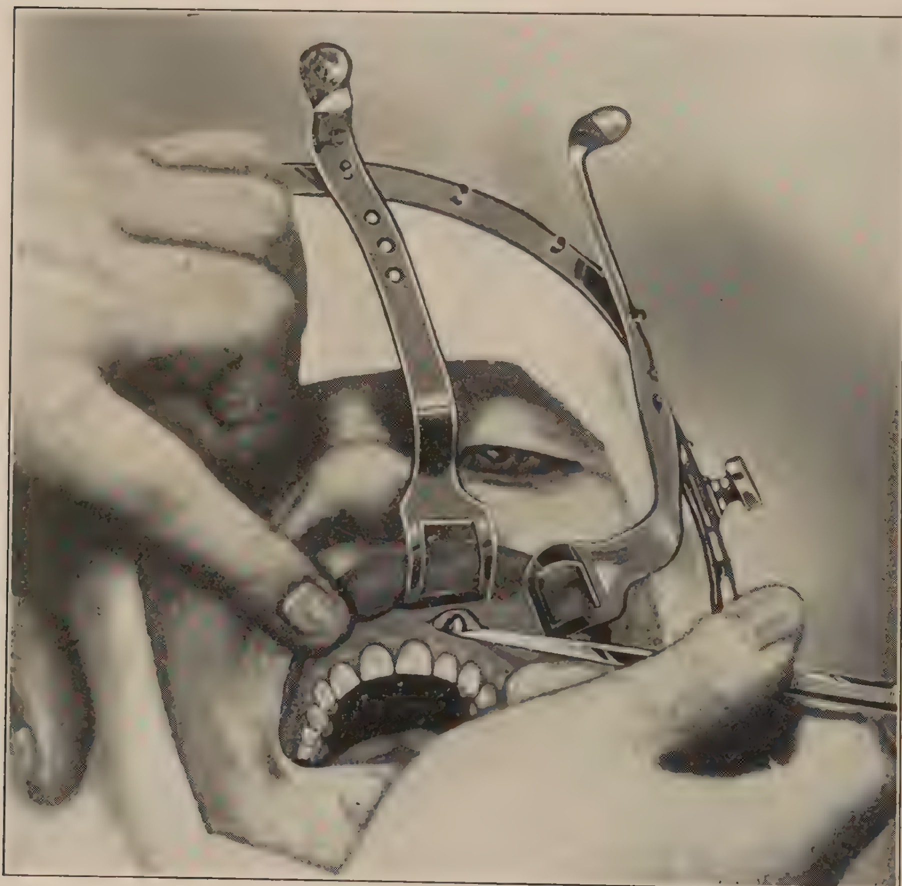


Fig. 164.—Outer plate of bone removed and chisel posed for sectioning root end.

alveolaris), or with a periodontal abscess. As I have before pointed out (Status of Apicoectomy, Journal of National Dental Association, March, 1918), apicoectomy should not be performed on multi-rooted teeth. Thus it will be seen that upon the selection of cases suitable for this operation rests the real reason why some

operators are successful, while others report the converse. The technic for performing the operation of apicoectomy is illustrated in Figs. 163, 164, 165 and 166, and I here quote such portions from the paper, above referred to, as will elucidate the subject:

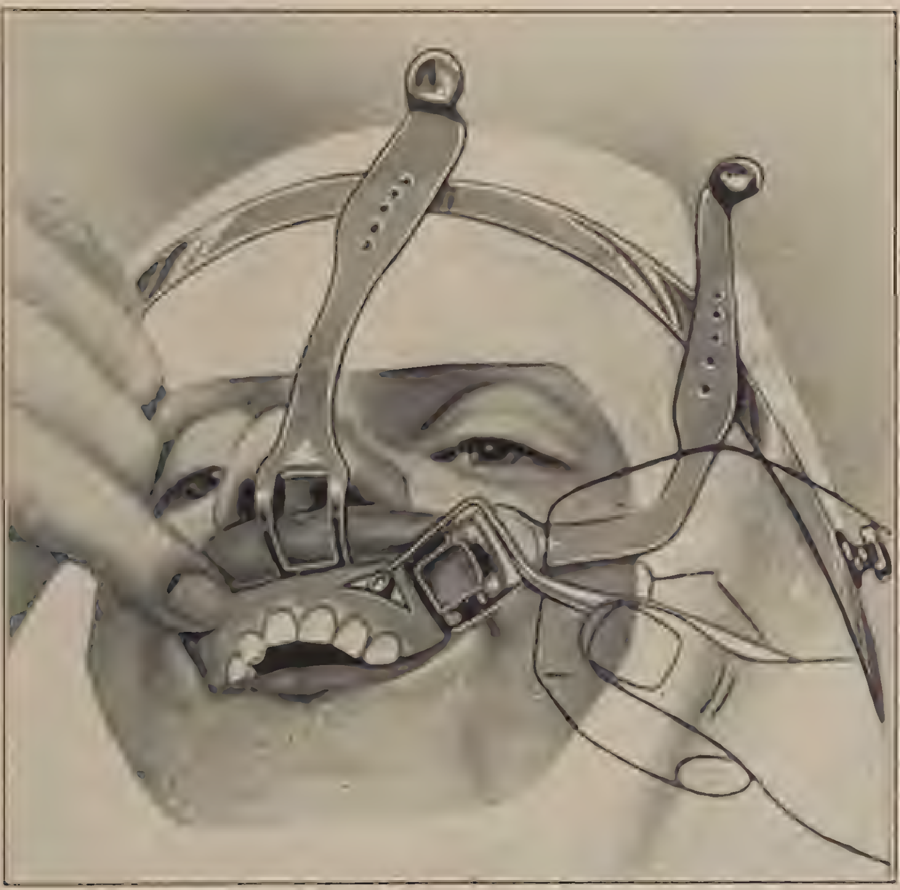


Fig. 165.—Granulomatous tissue being removed.

"The lip is retracted, sterile gauze is placed between the jaws and banked around the field; the patient is then instructed to close. Placing the gauze between the jaws obviates most of the unpleasantness incident to the blows of the mallet. A 25 mm. incision is made about 10 mm. from the gingival line, and the bone exposed by lifting the mucoperiosteum up, when operating on the

maxillae, and the reverse for the mandible. Having exposed the bone, the chisel is then employed to remove the overlying bone and to expose the apex and pericementoma. The chisel is then placed at the point where amputation is desired, and a sharp blow from

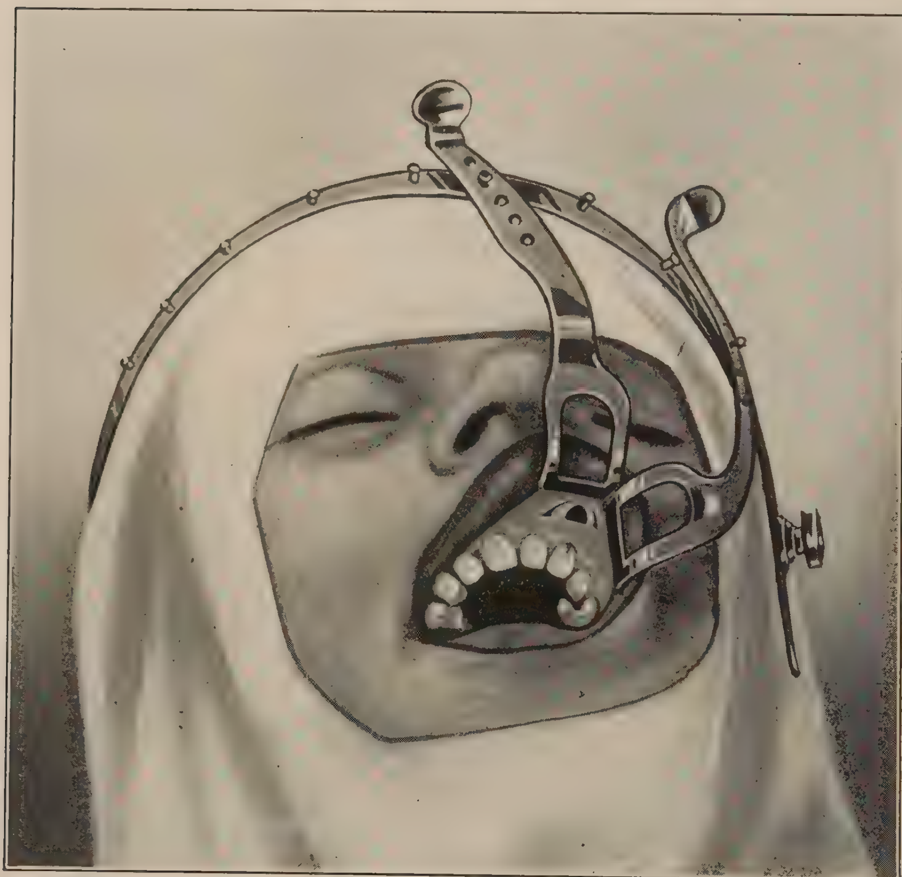


Fig. 166.—Wound is now in readiness for gauze dressing or for suturing.

the mallet finishes this part of the operation. No fear need be entertained concerning vertical fractures of the root, as in hundreds of cases where this technic was employed, not a single instance of vertical fracture resulted. A small curet is used to remove the granulations, and the wound may then be closed with two horse-

hair sutures, or a narrow strip of 5% iodoform gauze inserted. The latter method is by far the safest."

Apicoectomy is also of value where canal perforations have occurred in the apical third of any anterior tooth, and when canal

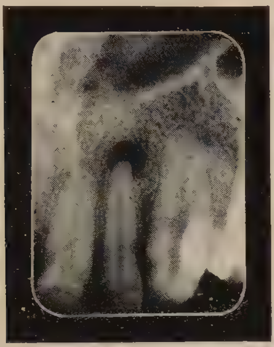


FIG. 167*A*.—Pericementoma of lateral incisor.

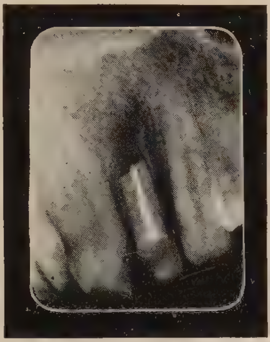


FIG. 167*B*.—Same as Fig. 167*A* following bone regeneration.

instruments have been broken off in the same region. Where conditions have been ideal, the life of an amputated tooth will be satisfactory to patient and operator. Ten years is not an unusual

FIG. 168*A*.—Pericementoma involving central and lateral incisors.

FIG. 168*B*.—Same as Fig. 168*A* after operation and bone regeneration.

time, as is evidenced in cases coming under my observation. Figures 167*A* and *B* and 168*A* and *B* show ideal cases for amputation and the results obtained.

CHAPTER XXII

REIMPLANTATION OF TEETH

Definition.—The replacing of a tooth that has been removed from its socket.

Children between the ages of 6 and 12 years are often the recipients of injuries resulting in one or more of the anterior teeth being loosened or entirely knocked out of their sockets. Adults, too, are frequently the recipients of such injuries.

Teeth that have been completely loosened or knocked out can be reimplanted and the prognosis is very good where due care is practiced.

The operation of reimplantation should follow the injury as soon as possible. I have reimplanted teeth that had been out of their sockets for as long as three days, but the ideal time is immediately following the accident.

Succinctly, the technic is as follows: The tooth is washed in warm water and green soap. The peridental membrane is *not* scraped off. After the washing, the tooth is placed in a weak bichloride of mercury and alcohol solution and kept there while the root canal instruments are made ready. The pulp is removed and the canal filled in the usual manner. From time to time the tooth is alternately dipped in a warm saline solution and the above mentioned alcohol solution. When the canal has been filled the tooth is replaced in the saline solution while the socket (which has previously been anesthetized) is thoroughly cleansed of the clot. Orthodontic bands or wires are then prepared so as to wire the tooth or teeth to the adjacent firm ones. At the end of three or four weeks the bands or wires may be removed. In after years the roots of reimplanted teeth may gradually absorb. There are, however, records

of reimplanted teeth having been in place for 20 years without showing any tendency to absorption. Due to the absence of the live peridental membrane a reimplanted tooth becomes ankylosed in its socket and is actually firmer than a normal member.

Transplantation of teeth, that is to say, the implantation of a tooth from the mouth of one patient to another is possible, but not indicated. Fixed and removable bridges are by far the best method of replacing missing teeth.

CHAPTER XXIII

HEMORRHAGE

Definition.—Bleeding; escape of blood from the vessels.

Hemorrhage is designated as *primary* when it follows the reception of any injury, accidental or surgical; *intermediary* or *post-operative*, when it occurs within twenty-four hours after having been once under control; *secondary* when it occurs any time after twenty-four hours and the healing of the wound.

Primary hemorrhage in and about the oral cavity can usually be controlled by the application of hemostatic forceps to the bleeding vessel; by sponges that have been dipped in water of about 160°F. or by packing the wound with iodoform gauze. (For the treatment of primary hemorrhage in cleft lip and cleft palate surgery see the respective chapters.) Hemorrhage following the extraction of teeth should be treated by firmly packing the socket with iodoform gauze. If the bleeding is seen to flow from the edges of the gum, the packing should not only fill the socket but quite an excess should be allowed to drape over the gum margins, the gauze rising above the occlusal surfaces of the adjacent teeth. The jaws should then be closed and a bandage applied. Intermaxillary wiring may be resorted to in severe cases of primary or secondary hemorrhage.

The surgeon must above all be calm about his procedure. One must remember that no vessel can bleed if caught in the jaws of hemostatic forceps. One must also remember that no profuse bleeding can continue if pressure or packing is effectively applied. In lecturing to students on the subject of treatment for hemorrhage, I have often employed the old story of the little Dutch boy who kept the dykes of Holland from inundating the land by merely

holding his finger in the hole he has discovered in the sea wall, until help arrived. Styptics are of but little value in persistent bleeding.

The actual cautery may stop bleeding but the objection to it rests in the fact that following the separation of the slough produced, the bleeding is likely to recur. The simplest method of controlling hemorrhage following tooth extraction consists of dipping a piece of gauze or linen in an antiseptic mouthwash and thoroughly wringing it free from all excess of the liquid. The gauze or linen should be from eight to twelve inches square and is then folded and compressed so that the final size is not larger than an ordinary walnut. The surface of the compress that has no convolutions (through which blood might trickle) is placed over the bleeding socket or sockets and the patient instructed to comfortably close the jaws. Neither the patient nor the dentist should allow curiosity to induce them to make frequent inspections of the progress of the control. The patient must remain absolutely quiet, in a recumbent position, and the compress must not be disturbed for at least thirty minutes. In the average case this is sufficient to allow the formation of a clot. If the bleeding has been materially checked, but not completely, the treatment should be repeated until a satisfactory result is obtained. In this way no blood nor valuable time is lost, if it is found that this treatment is ineffective, it may be supplemented by bandaging, or intermaxillary wiring. Small clots should not be disturbed, but if the clot becomes cumbersome and the bleeding continues around its base, it should be removed and the wound irrigated with an iced 3% peroxide of hydrogen solution. This procedure is often followed by a prompt checking of the hemorrhage. Morphine is a drug par excellence in quieting the alarmed patient and also slowing up the circulation. If the above measures fail to bring about a clotting (note that I do not say if unable to stop the bleeding, because, in the mouth, bleeding can always be controlled by digital pressure)

then it becomes necessary to employ other expedients as set forth in the chapter on Hemophilia.

HEMOPHILIA (HEMORRHAGIC DIATHESIS)

Definition.—A disease characterized by an abnormal chronic tendency to immoderate hemorrhage.

Hemophilia is confined entirely to the male sex and is hereditary. The so-called "bleeder" or hemophiliac is always aware of his condition, as are his parents. It might truthfully be said, that unless a given case of bleeding (it matters not how profuse it may be) gives a history of hemorrhagic experiences since infancy, the patient can not be classed as a hemophiliac. While females have never been known to be affected with hemophilia or an inherited tendency to bleed, they alone *transmit* the disease to the male offspring. Women who give birth to hemophiliacs are also capable of having normal male children. There are really more hemophiliacs living than is commonly supposed but they shun surgical interference unless, of course, in absolute desperation; thus by absenting themselves they appear to be less in number. A great many hemophiliacs die at child birth from umbilical or other injuries or abrasions. Trifling operations, such as circumcisions or extraction of loose deciduous teeth have been followed by fatal hemorrhage. In fact, it is nearly always a minor injury or operation that precipitates a severe and alarming hemorrhage. The bleeding may be external through any wound; internal, as intestinal bleeding, or (which is quite characteristic of the true hemophiliac), he may have an extravasation into the joints, particularly into the knee or elbow joint. According to the development of the views of Buchanan, Schmidt and Osler, the factors in coagulation are fibrinogen, prothrombin, thrombokinase, and calcium, and by the interaction of the last three, thrombin is produced, which, acting on the fibrinogen, precipitates fibrin. The clotting time, which in normal persons is from three to five minutes, may be prolonged to sixty

minutes or more in hemophiliacs. In parenchymatous hemorrhage (capillary oozing), the clotting tendency, in some cases I have observed, seems to be entirely absent.

Diagnosis.—As inferred above, no solitary bleeding experience is ever a sign of hemophilia. The history must relate of alarming hemorrhage from finger pricks and other minor injuries common to boyhood. Epistaxis (nose bleed) scalp wounds and opening of boils have resulted in death. If the patient has survived these experiences he will not fail to relate them, and due attention should be paid to the narrative of any male who is about to undergo any operation however minor, and who prefixes his remarks with the statement that he is a "bleeder."

Hemorrhage may be arterial, which is characterized by pulsating or spurting of bright-red blood; or venous, a quiet, steady flow of dark-red or purplish blood (the latter being unaffected by the heart action). Finally, bleeding may be from capillary vessels and may be either bright-red or a mixture of arterial and venous blood.

Treatment.—The treatment of hemorrhage from tooth sockets or from the lancing of any abscess, consists chiefly of firmly packing the wound, and efforts to improve the clotting time of the blood. If, prior to the extraction, the patient is known to be a hemophiliac, everything must be in readiness to pack the socket immediately following the extraction. The packing should not be disturbed until it loosens of its own accord. It is well also to have a donor, whose blood has previously been typed, ready for the purpose of giving a direct blood transfusion. Calcium lactate, two to four grams daily (0.30 to 1.0 gram after meals) has a wonderful effect on reducing the clotting time. In some instances, however, calcium lactate seems to have little or no effect. Abscesses occurring in hemophiliacs should be aspirated by inserting a dull needle into the most pendent portion. But even this method of releasing the pus may be followed by a prolonged and alarming hemorrhage. Lancing should be avoided, if at all possible.

The method of packing a socket is described, in the preceding chapter but there are certain points from which blood may spurt or ooze where packing is difficult or impossible; the hard palate offers just such a point. In hemorrhage from any point on the hard palate it is best to tie fine orthodontic wires from cuspid to cuspid, also from right premolars to the corresponding left premolars. The molars may be treated in the same way (Fig. 169).

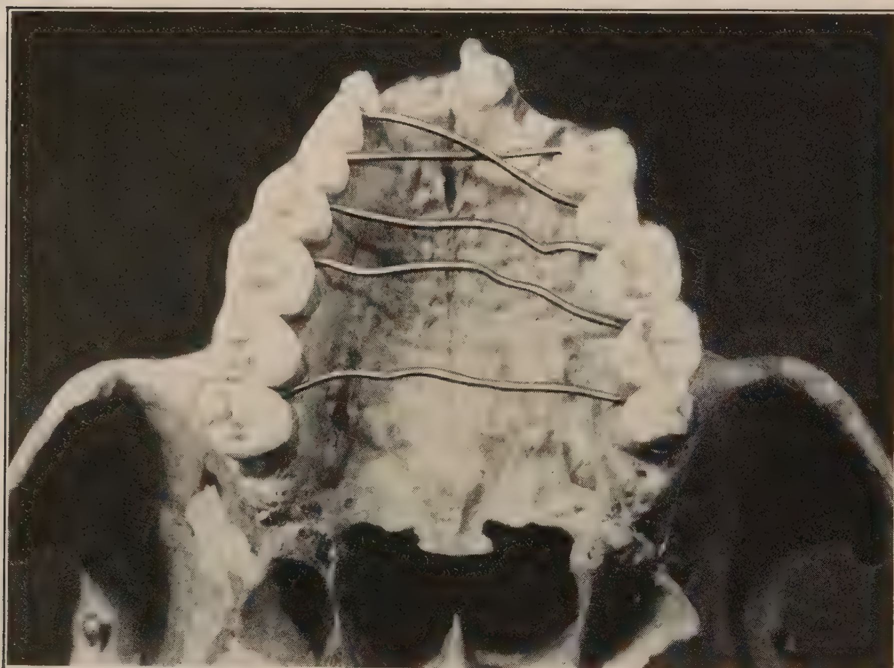


Fig. 169.—Wires tied to both right and left maxillary teeth. Gauze is packed between this cradle and palate for control of immoderate hemorrhage.

A large piece of iodoform gauze is then packed between the wire cradle and the vault. The gauze should remain in place for a week before disturbing it. The objectionable odor of iodoform can, in a measure, be corrected by frequently holding a pleasant mouthwash in contact with the gauze. At the end of a week the gauze should be removed by daily pulling a small piece backward over the last wire and cutting it off with bandage scissors. Where only a few

teeth are present, thus precluding the use of the wires, an impression should be taken with modelling compound. The impression must include all of the upper teeth present as well as the entire palate. A model is quickly made of fast-setting plaster and a plate made to cover the teeth and palate. The plate is made of the ordinary "trial plate" material thus dispensing with vulcanization. This plate or tray is much better than the use of the ordinary impression tray filled with compound or plaster as it is more comfortable and less in the way of the mandible. During the time of this laboratory work, the patient is supplied with a gauze ball made

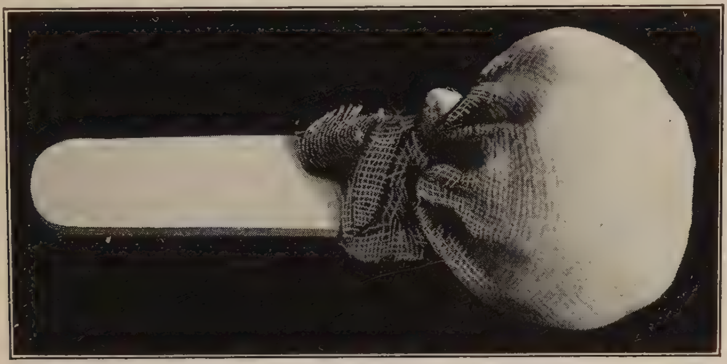


FIG. 170.—Large gauze ball tied to wooden tongue depressor for temporary control of palatal hemorrhage in hemophiliacs.

of ordinary hospital sponge material, fitted to a wooden tongue depressor (Fig. 170). If kept in place no bleeding will occur. The plate being ready, a quick setting plaster is mixed and poured into it. This is then carried to place and held until the plaster is quite hard. The patient is instructed not to bite on this appliance and in order to rest the mandible he is provided with a piece of soft rubber to act as a buffer between the jaws. As long as the appliance is controlling the hemorrhage one should not be in a hurry to remove it. I have kept one such appliance in place for eight days. A mouthwash should be in constant use. If this procedure has been tried for a week or more without improving the clotting time,

it will be necessary to plug the nasopalatine or posterior palatine foramina, depending upon the location of the bleeding point. This is best accomplished by lifting the mucoperiosteum from the bone with a blunt periosteal elevator, and when the foramina are

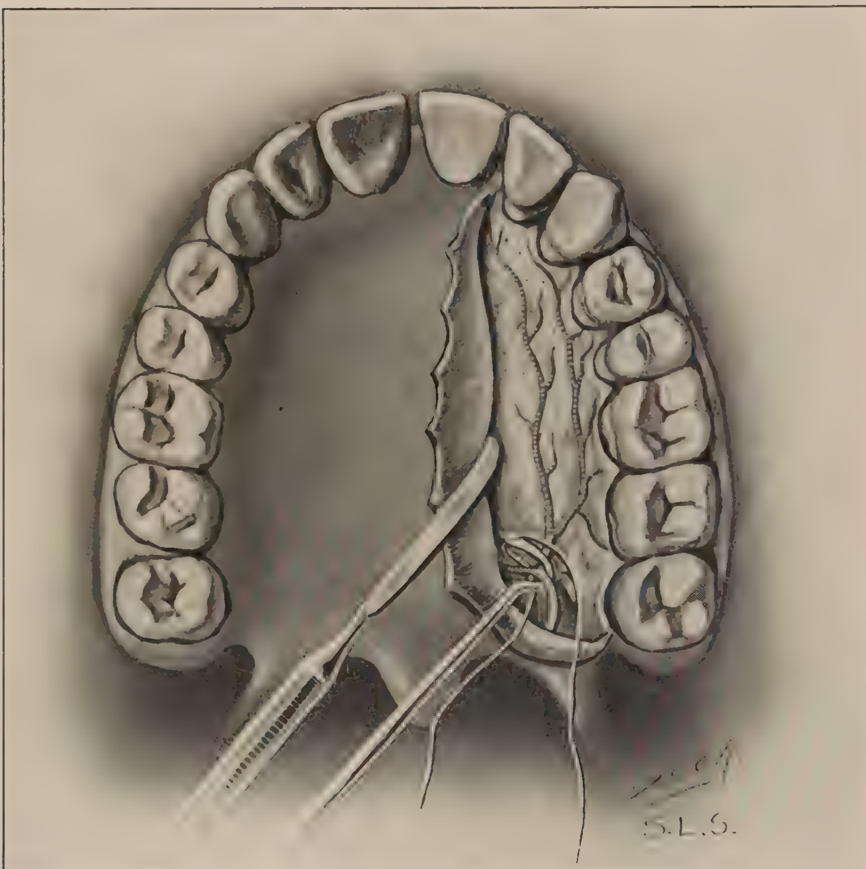


Fig. 171.—Shows author's operation for ligating anterior palatine artery in palatal hemorrhage in hemophiliacs.

exposed, an orange-wood stick, such as is used for manicuring, is driven in with a mallet and then cut off flush with the bony palate. The mucoperiosteum is returned and held in place with the gauze and wire arrangement, or with the plate and plaster; suturing should be avoided. The orange-wood plugs will be exfoliated in

two to three weeks but should not be removed until they are absolutely loose.

The author has ligated the palatine vessels on five occasions, using either catgut or black silk, with perfect results. The technic consists principally of lifting the mucoperiosteum away from the necks of the teeth, using the knife as little as possible. The periosteal elevator does most of the dissection. The vessels are easily identified as they emerge from their foramina and will stretch quite a distance (Fig. 171). A right angle aneurysm needle carrying black silk, preferably, is then passed around the vessels and nerves and the tie is made. The flap is then returned and treated as described above. The operator is cautioned against the practice of blindly attempting to place several sutures along where he "supposes" the palatine artery to be. One must remember that the anterior palatine artery lies close to the bone and in some cases in a groove. When passing needles into this area, with the hope of incorporating the vessels, the chances are more in favor of lacerating them rather than passing around them. This procedure, however is most valuable in the soft palate and in the floor of the mouth or other places where no bone is in contact with the artery. Distant ligation of arteries, such as the external carotid, is of little, if any benefit. This is due to the fact that arteries when ligated, cut or otherwise obstructed at a given point, at first do not allow blood to the parts supplied by it. Thus, pulsation will cease in the temporal artery after ligating the external carotid and there will be a diminished surface temperature. But this may last only for a few days, and at times, only for a few minutes, followed by more blood to the part than in normal tissues. Following ligation of a vessel, the neighboring arteries of the same side (there is very little anastomosing across the median line) permanently dilate and the cut-off area is then supplied by the adjacent arteries. The collateral circulation thus formed is brought about through a *reversal* of the blood current

so that the distal branches of a ligated artery soon re-establish their function. Even if the common carotid artery is tied, the mouth and associate parts are supplied by the inferior thyroid through the reversal of current. The vertebral artery is also a factor in re-establishing blood supply.

Thus it will be seen that ligation, unless it is very near the point of hemorrhage, can be of but little help to a hemophiliac. It must, however, be understood that in normal patients, ligation of the external carotid is at times indicated, because, before a collateral circulation can be established, the coagulation element has already asserted itself and the object has been obtained.

The constitutional treatment for hemorrhage in hemophilia consists of subcutaneous injections of the various serums, either human or animal, in doses of 10 to 30 c.c. two or three times a day. Direct transfusion of blood is at times very effective and the simplest transfusion consists of taking venous blood from the basilic vein of the donor and injecting it into the same region of the recipient. Four to five hundred c.c. of blood may safely be used. As before mentioned, the donor's blood should be directly typed with that of the recipient, or else serious, if not fatal, results will surely follow.

The patient should be propped up in bed as much as possible, so as to prevent too easy a blood flow from the heart. Morphine in effective doses should be in constant use, as this drug has a good effect on slowing the circulation as well as allaying the extreme nervousness that these patients necessarily experience.

Should an operator be so unfortunate as not to be able to stop a hemorrhage in a hemophiliac by the methods above mentioned, the patient has one final and desperate chance of spontaneously ceasing to bleed; and that is dependent on the patient *losing more than one half* of his blood content. The tone of the circulation being then at low ebb, it has been noticed that spontaneous coagulation takes place. Above all, the oral surgeon must remember that fatal

terminations in these cases is not dependent on the *amount* of blood lost, but on the *rapidity with which it was lost.* In one grave case of hemophilia referred to the author, it took nearly two months for the blood to coagulate enough to heal a small palate wound.

In the end we were rewarded with success, but without the expedients named above, the patient would no doubt have died within a week after the wound was made.

To sum up, let it be clearly understood that local control of hemorrhage is more important and more effective than constitutional treatment, although the latter should always be applied.

CHAPTER XXIV

IMPACTED TEETH (MALPOSED TEETH)

Definition.—Teeth fixed in such positions as to prevent their normal eruption.

In most cases impacted teeth are so situated that their eruption is prevented by the surrounding teeth. In other instances they are not hindered by any other tooth and, therefore, may be more properly designated as *unerupted teeth.*

The cause of impactions is not definitely known, though it may be considered as due to the gradual shortening of the mandible and maxillae in the course of evolution. The mandibular third molar is the tooth most commonly impacted, the maxillary third molars next, and the cuspid of the same region third in point of frequency.

In this discussion, all teeth that are malposed, unerupted or impacted will be referred to as *impacted* teeth. Among the local contributing causes of impactions, may be mentioned prolonged retention of the deciduous teeth or early loss of the same teeth.

Diagnosis.—Prior to the use of the roentgen ray in dentistry, the finding of impacted teeth was only possible where they were partially erupted, or, when severe infections made surgical entrance imperative. It is now quite an easy matter to diagnose impactions by the roentgen ray.

The symptoms may be local or constitutional, or may be entirely absent. The local symptoms usually consist of tumefaction, pain, and when in the region of the third molars, trismus. The constitutional disturbances may consist of insomnia, mild neurosis, and vague neuralgic pains. Impacted teeth may also cause dentigerous cysts, which see. I am not at all in accord with

the opinion that impacted teeth are the cause of trigeminal neuralgia. Their removal will not cure this form of neuralgia.

Treatment. Whether or not impacted teeth cause obvious local or systemic disturbances, their presence is certainly not normal and, for this reason, if for no other, they should be removed. The removal of impacted teeth is looked upon by a great many as a

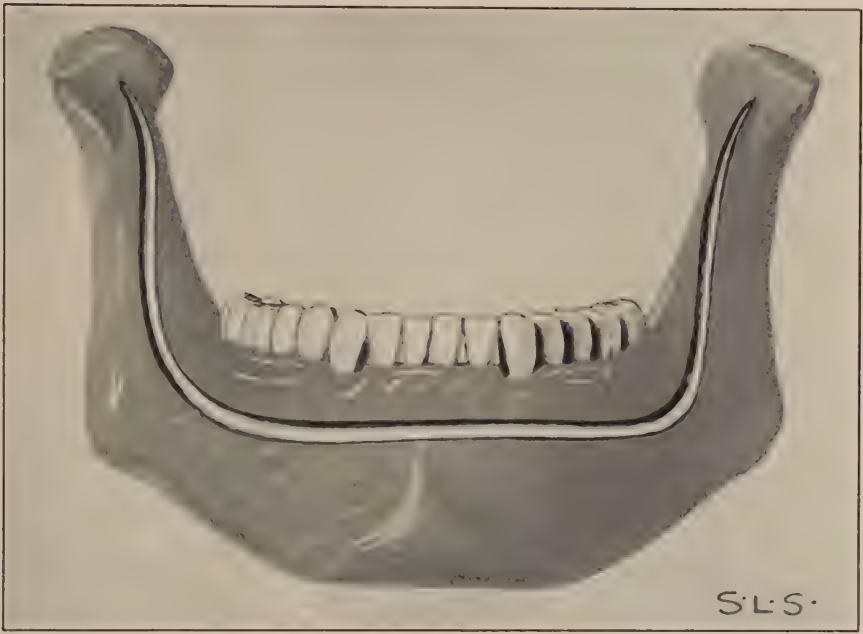


FIG. 172.—Shows that an intra-oral incision can safely be made from the tip of the coronoid process to tip of coronoid of the opposite side without severing any important vessel or nerve.

bugbear, and if the reason for this undue view is sought, it will be found that those who dread performing this rather simple operation, are not at all willing to properly expose the field. They fear to make an ample incision, and dread cutting away sufficient bone to facilitate the removal of the impaction. Neither of these views is warranted, as one cannot sever any important vessel or nerve by intra-oral incisions. (Figs. 172 and 173.) The removal of palatally impacted cuspids is the only region requiring care in

making the incision, and even here severence of the nasopalatine vessels is not a serious accident, excepting in hemophiliacs. In such cases, removal of impactions, and in fact, no operation that can possibly be avoided, should be attempted. (See page 212.) There is not the least danger associated with the removal of suffi-

Fig. 173.—Represents a bold but safe incision directly to the inferior border of the mandible. Note that facial vessels are respected.

cient bone in order to remove a badly impacted tooth. There is, however, a great deal of danger associated with a blind and frantic effort to elevate a tooth that is locked by the ascending ramus behind, and by the second molar in front.

Oftentimes, especially in cases under twenty-five years of age, impactions, such as shown in Figs. 174*A* and 174*B* can be removed

in a few seconds time, without removing any bone, or even making an incision. This same kind of impaction, in a person of middle age or over, may result either in a fractured tooth, or jaw, if an attempt is made to use the elevator, and the elevator alone.

Here lies the reason why some apparently similar impacted teeth are easily removed and others require bone dissection and considerably more time: Some osseous structure is more spongy than others; this is noticed in youths and in young adults, while in later years the bone becomes less spongy, less resilient and consequently will yield less to the force of elevation. Some teeth have a

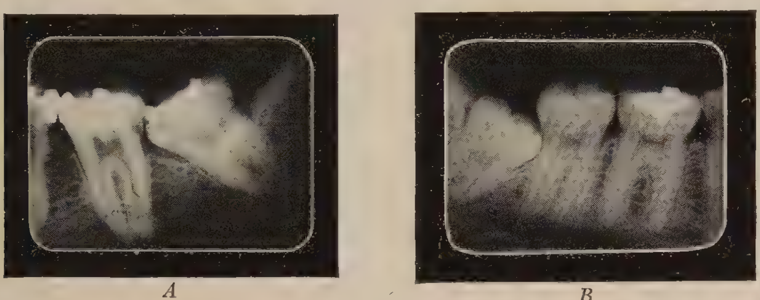


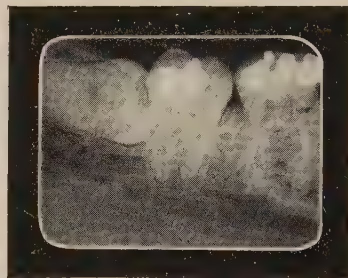
FIG. 174*A–B*.—Shows type of spongy bone in youthful patients. These impactions can be easily removed (Roentgenogram by Chas. Chandler).

rarefied area that facilitates a distal delivery of the tooth (Fig. 175). The roentgenogram, if it has been properly placed, exposed and developed, will reveal the spongy structure of the bone and the extent of the rarified area posterior to the crown. It will also tell the discerning eye whether one will have difficulty or not in the removal of a given impaction. *If the trabeculae are too close together, the removal will consume more time than where the trabeculae are sufficiently spaced.*

There are three methods employed for the removal of overlying bone: (1) the use of surgical burs; (2) mallet and chisel; (3) hand-pressure chisels. Except in the young patient, chisels are not as well adapted to this operation as are new surgical burs. The reason for this is, that while the bone may be chisled in the young

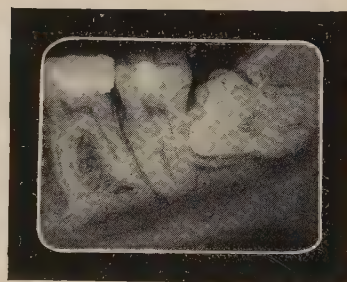
—cleaving off curled pieces of bone that resemble planings of certain wood—in older patients the bone is seen not to cleave along

FIG. 175.

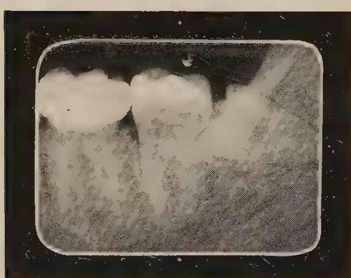


A

B



C



D

E

FIG. 175.—Rarefied area posterior to mandibular 3rd molar.
FIG. 175*A*, *B*, *C*, *D*, and *E*.—Various types of impacted mandibular molars (Roentgenograms by Chas. Chandler).

the path of the sharp chisel, but to fracture and shatter ahead of the chisel.

Due to the compact condition of the bone, the elevation is not easily affected. Results in oral surgery, and not the methods

FIG. 176.—Impacted mandibular 3rd molar in ascending ramus associated with a dentigerous cyst.

employed, is what should interest one most. Therefore, it is my practice to have at hand chisels, as well as burs, at every operation on the mandible. Impacted teeth of the maxillae, however, rarely need burs, as the bone is usually very thin and easy to cleave off, particularly in the third molar region. When removing cuspids,

FIG. 177*A*.—Impacted mandibular 3rd molar lying directly under roots of second molar. Discharging fistula posterior to 2nd molar.

the bone of the palate may, at times, be better removed by burs than by the chisel method alone. Above all, the bone surrounding impacted teeth contains no vulnerable tissues; that is, not where the cutting away is to be done; and when cut away, it can, and does, regenerate. This should be very encouraging for those who fear to remove sufficient overlying bone.

Moreover, trismus, severe pains, tumefaction and other unpleasant sequelae, follow only in cases where prolonged and traumatizing elevation was employed, whereas, where ample dissection has first been done, one or two applications of the elevator is sufficient to deliver the tooth. The after discomforts are,

FIG. 177*B*.—Same as Fig. 177*A* after removal of second and 3rd molars and after bone regeneration.

in most cases, of no consequence. For the past few years students in the colleges, with which I am connected, have had these claims thoroughly demonstrated.

The statement made above in reference to the bone having no vulnerable or important vessels or nerves in the region where the impaction exists, refers, of course, to the average run of impactions, as shown in Figs. 175*A*, *B*, *C*, *D* and *E*.

The removal of bone in cases similar to those shown in Figs. 176, 177*A* and *B* and 178 must be done by one who is well versed

FIG. 178.—Unerupted mandibular molar in semi-edentulous jaw. A pathological fracture almost resulted. Note absorption of distal root (Roent. by J. S. Derr).

in the anatomy of the parts. Figure 176 shows an extensive dentigerous cyst. Figure 177*A* reveals an undermined second molar with sinus opening on the alveolar ridge just posterior to the

second molar. In this case the second molar had to be removed, in addition to the third, owing to the fact that the necrotic process had destroyed the pulp of the second molar. Figure 177 *B* shows the satisfactory osseous regeneration which follows the removal of the impaction and the diseased bone.

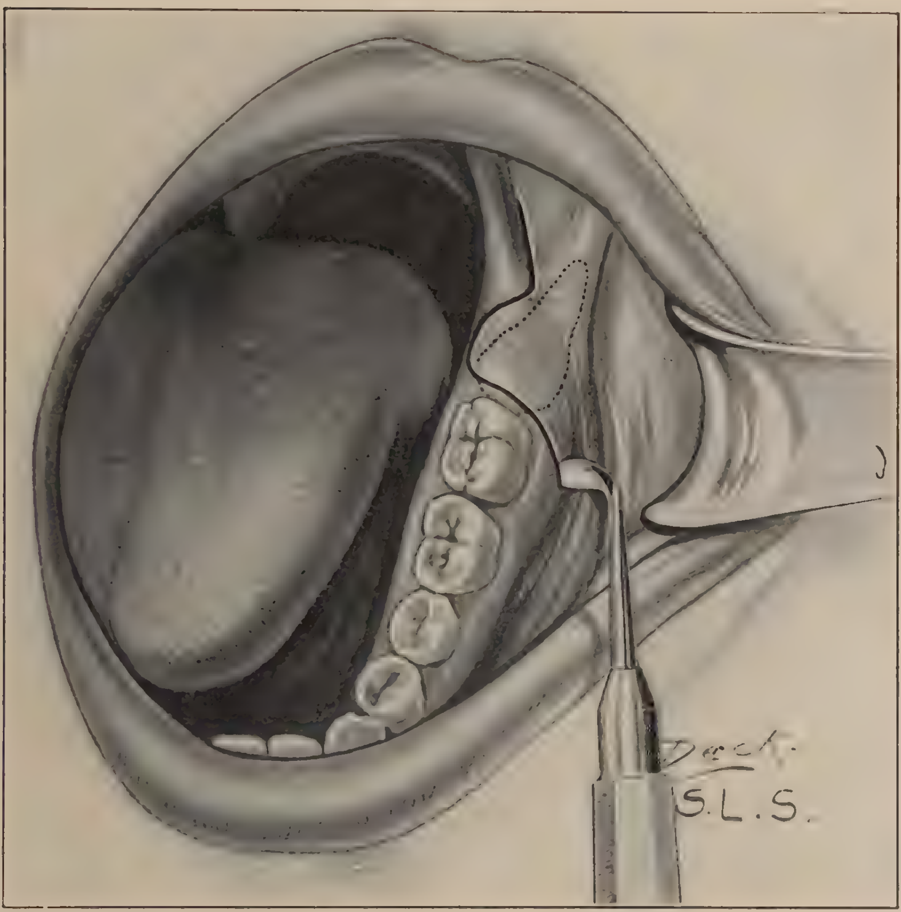


FIG. 179.—Ideal incision for average impacted mandibular 3rd molar. It is the author's claim that the lingual dip of this incision followed by retraction will minimize trauma and *better expose the field.* Illustration shows suitable shape of scalpel for cutting the tendinous mucoperiosteum, in the retromolar fossa.

REMOVAL OF MANDIBULAR THIRD MOLARS

There can be no standard incision for all types of impacted teeth, but the incision shown in Fig. 179 will serve in the average

case. Variations from this incision are, at times, necessary to suit the individual case. Figure 180 shows the method of retracting the soft tissues. Due to the inaccessability of the average mandibular third molar impaction, retraction is often difficult,

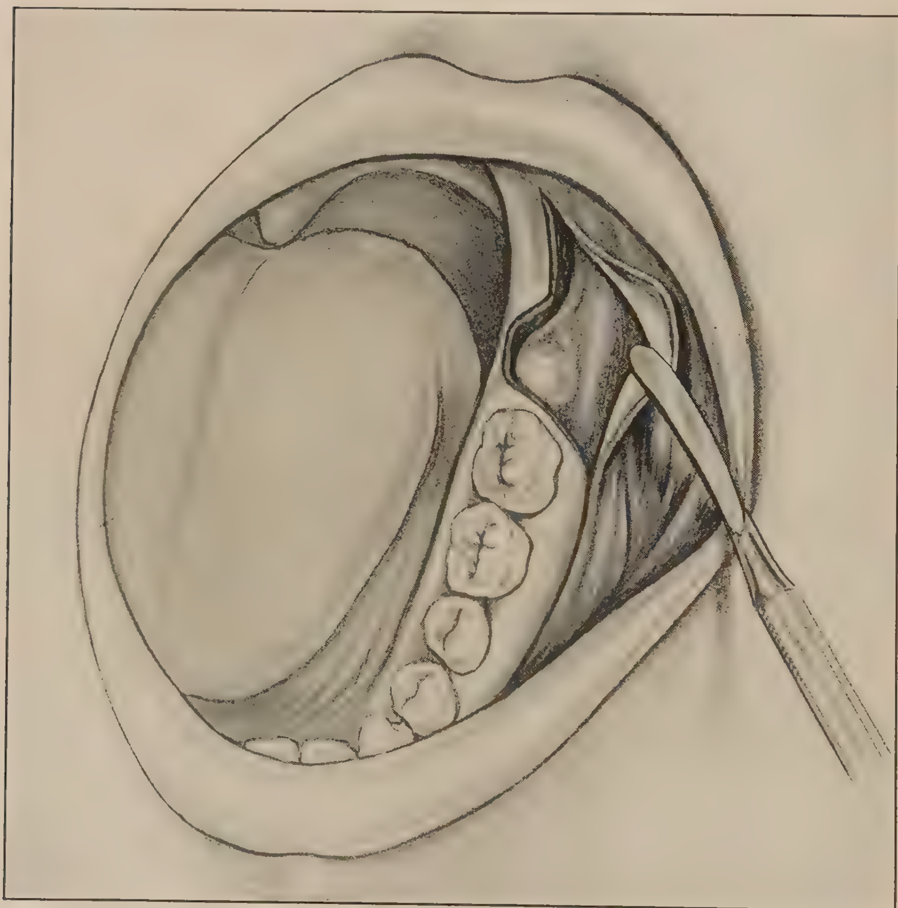


Fig. 180.—Same as Fig. 179, note that incision facilitates exposure of the field.

but if a straight instrument is used, such as a periosteal elevator, the field is better seen. Hooked retractors are of but little help. The cheek retractor, held by the assistant, is of considerable value in allowing a sufficient quantity of light to reach the area. Epinephrin is an important drug to control the hemorrhage that would

otherwise interfere with an expeditious removal of the impaction. Hemorrhage is an annoying factor in these operations, especially to an operator of limited experience.

The amount of bone to be removed with chisel or bur is predetermined by an examination of the roentgenogram. During

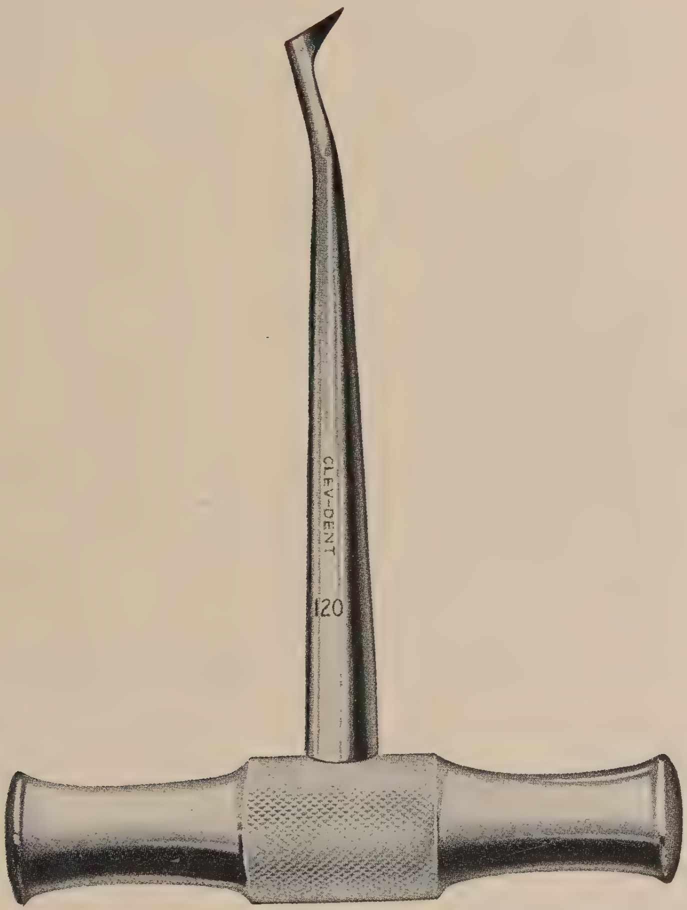


FIG. 181.—Winter-Cryer elevator.

the operation, the roentgenogram should be placed in a small illuminated diagnostic box so that frequent examination is possible. The anterior portion of the ascending ramus, bounded by the internal and external oblique ridges, is usually the portion first to be removed, as this is the principal impacting factor. Very little

of the buccal portion is to be removed. Sufficient space, however, is made between the tooth and the bone on the buccal side to allow the application of an elevator. The Winter-Cryer or the Henahan elevators are very well adapted for this work (Figs. 181 and 182). The bone, in this region being thick and strong, is used as a fulcrum when elevating the tooth (Fig. 183). Too heroic attempts at elevation should not be practiced; it is much safer, more surgically correct, and less brutal in appearance, to remove a little more of the osseous structure, when necessary, than to subject the patient to repeated and often fruitless attempts at elevating the unreleased tooth. The lingual plate of bone should not be cut away, as it will nearly always stretch sufficiently to allow the delivery of the impacted tooth. Should the lingual plate fracture, it should be pressed back into position. Fracture of the lingual plate is exceedingly rare and is more likely to occur in cases where insufficient dissection is done, above and buccally, to the impacted tooth.

Fig. 182.—Henahan elevator.

The impaction having been removed. all particles of bone are removed and the cavity irrigated with a bland antiseptic. Closing of the wound by suturing is not to be recommended. The surgical principle of drainage, so well founded, offers the best mode of handling the wounds in the region of the retra molar fossa. A light dressing of 5% iodoform gauze is placed into the cavity and allowed to remain for forty-eight hours. Where little difficulty attended

the removal of the tooth, the iodoform gauze dressing need not be renewed, but where considerable dissection or elevation was necessary, it is best to renew the dressing two or three times. Where post-operative pain is encountered, the dressing can be

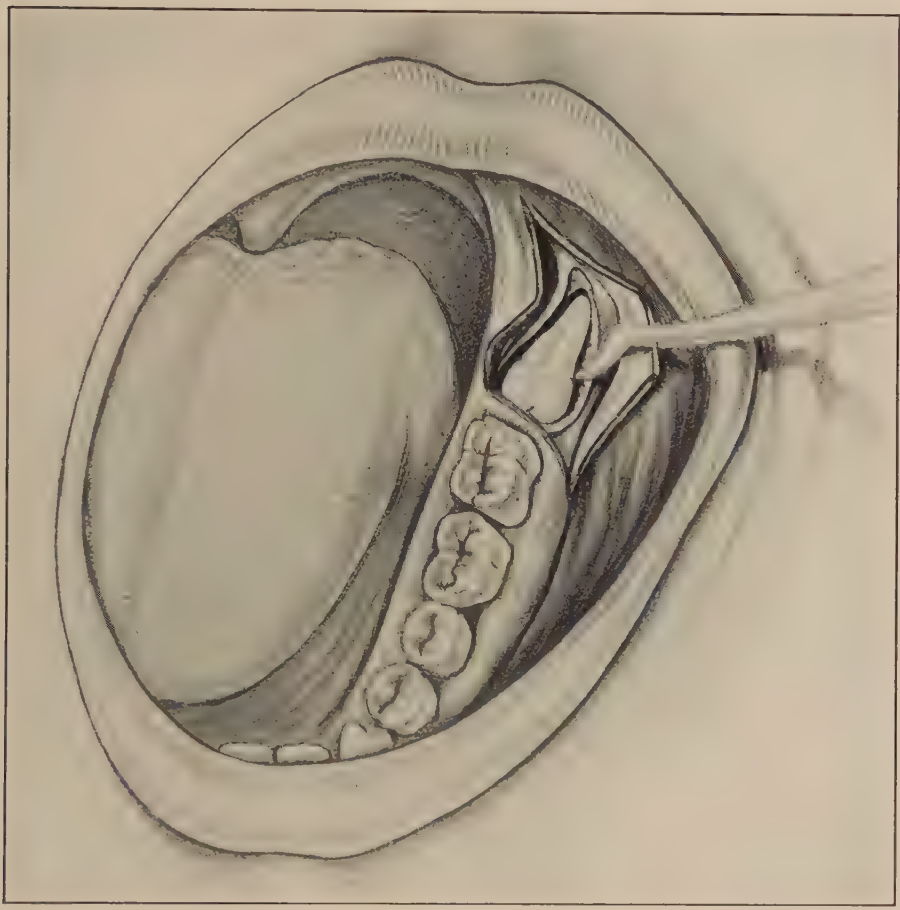


FIG. 183.—More bone than necessary was purposely removed in order to emphasize statements made in text.

dipped in a solution of guiacol one part, olive oil five parts, or in a solution of chloretone in essential oils. The so called "dry socket" following any extraction is also benefitted by these agents. Scarifying a dry socket with a sharp instrument until bleeding results gives almost immediate relief.

REMOVAL OF MAXILLARY THIRD MOLARS

Figure 184 shows the incision made for the removal of the average impacted maxillary third molar (Fig. 185). The retraction of the soft tissues, as in the case of mandibular impactions, is best accomplished by a straight instrument. One end of the

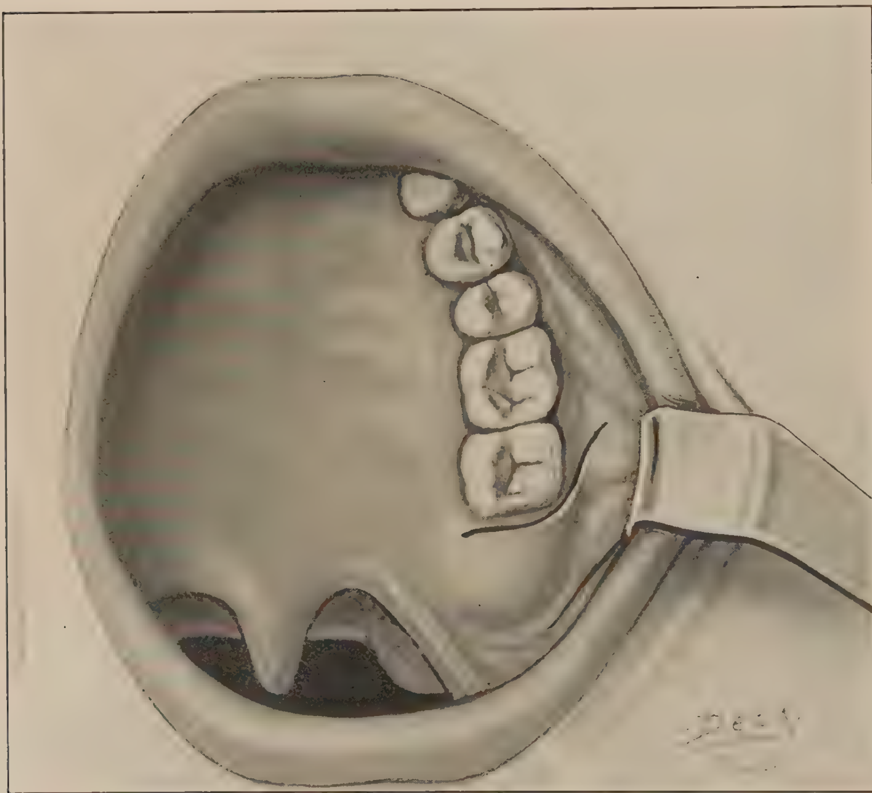


FIG. 184.—Incision for the removal of impacted maxillary 3rd molars. If the impaction does not incline palatally the buccal portion of the incision is sufficient.

instrument is held firmly against the bone, while the other end is carried laterally away from the face. This serves to expose the desired area as well as to retract the corner of the mouth (Fig. 186A and *B*). The buccal plate of bone can often be lifted with a chisel and hand pressure, as it is very thin and shell-like. If a mallet is used, the blows should be light. Having removed a

sufficient quantity of the buccal, and in some cases, occlusal portion of the bone, a Lecluse or a Henahan elevator is applied, using the second molar as a fulcrum. The direction of force must be directed backward and outward. If this advice is followed, the danger of forcing the tooth into the antrum will be obviated. If the point of the chisel or elevator penetrates into the antrum, the accident will not be serious, providing no attempt is made to sterilize (?) the entrance by painting strong solutions of iodine at the point of injury. Intentional punctures of the antrum for diagnostic purposes, whether done intra-orally or through the nose, always heal by first intention. Therefore, accidental entrance should not

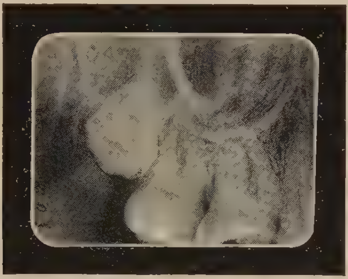


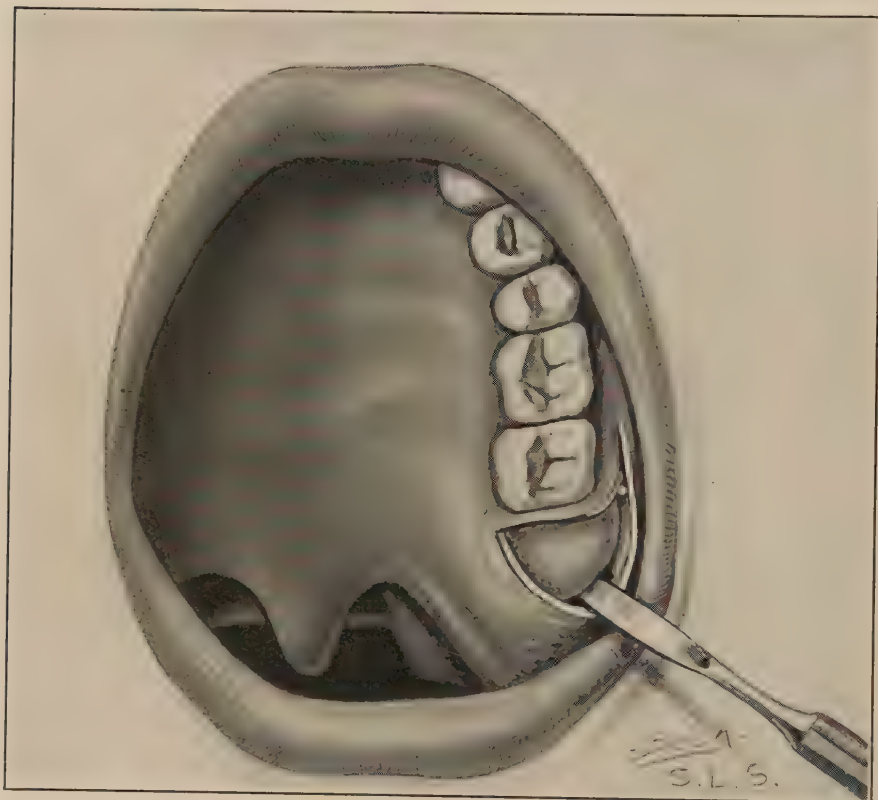
Fig. 185.—Impacted maxillary 3rd molar.

result in infection, providing sterile instruments were used and no undue tampering employed.

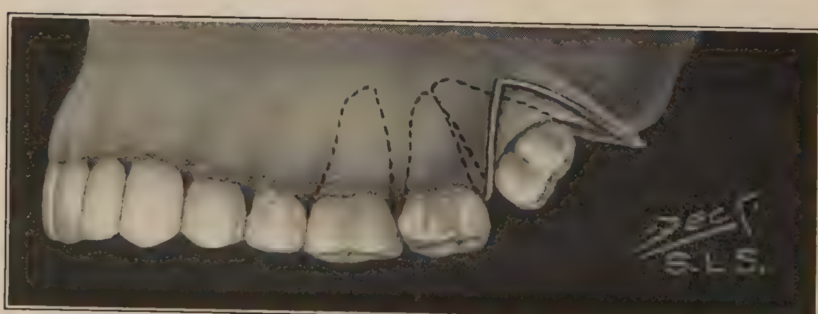
Due to location, drainage takes place by gravity, and a single dressing of iodoform gauze allowed to remain forty-eight hours is sufficient after-treatment. As in the case of wounds of the mandible, occasioned by removal of impacted third molars, it is not advisable to suture, as the cheek at once replaces the flap and holds it in position.

REMOVAL OF MAXILLARY CUSPIDS

Impacted maxillary cuspids if found to be lying wholly, or nearly so, in the palatal process of the maxillae are to be approached palatally. A roentgenogram made after the order of



A



B

Fig. 186*A–B*.—Shows retraction of the flap with the aid of a straight instrument. Bone has been removed from crown of 3rd molar (Modified from Berger).

Fig. 187 will ascertain its correct position. The ordinary dental film can only show that the tooth is present and impacted but the large oral film, with the rays directed so that the central rays pass

Fig. 187.—Impacted maxillary cuspid (Modified from Boyd S. Gardner).

through the root of the nose, and at right angles to the film, will reveal whether the impaction is labial or palatal.

The incision and retraction of the flap for a palatal approach is illustrated in Figs. 188 and 189. The bone may be removed with

a sharp chisel and mallet, or a surgical bur may be used. Excessive elevation should be avoided and the fulcrum should always be the surrounding bone rather than the neighboring teeth. Particularly

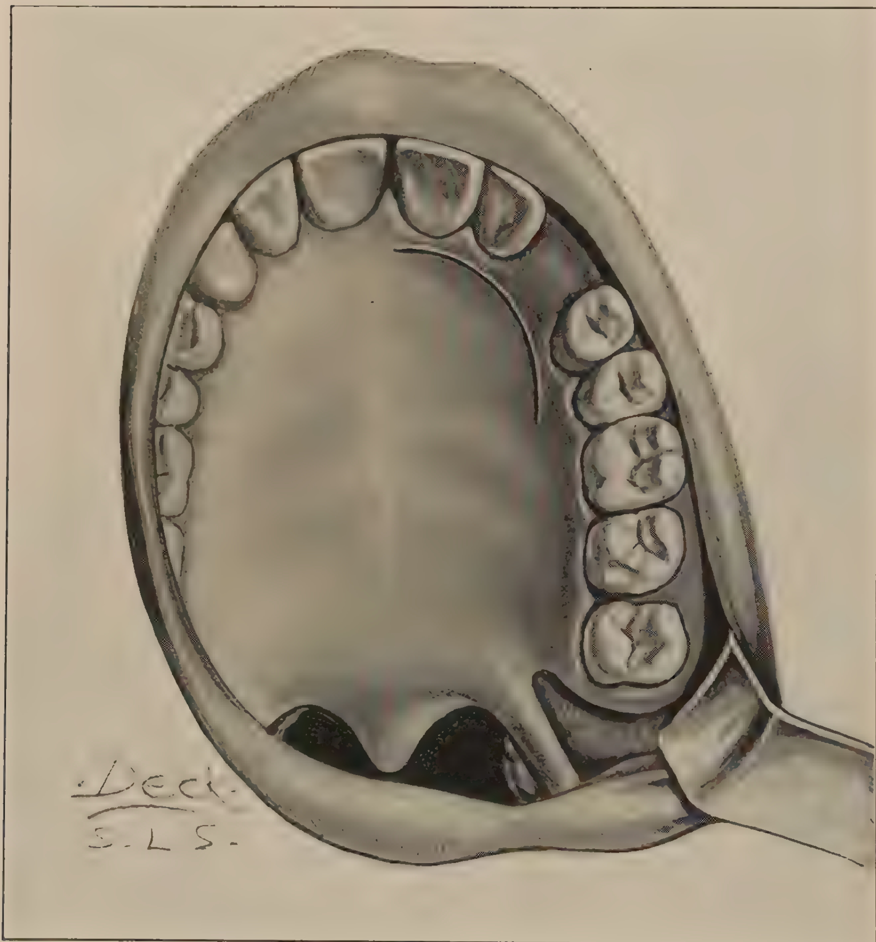


FIG. 188.—Incision for the removal of an impacted cuspid as shown in Fig. 187.

is this true if insufficient bone has been removed. The cuspid being a larger and more firmly fixed object, the use of the adjacent teeth as fulcra may loosen or dislodge them. The direction of force in elevating, should, in the main, be downward. This is easily accomplished if a space has been cleared at the side of the crown, sufficient

to permit the application of an elevator (Fig. 190). The cavity, formed by the removal of the tooth, is irrigated with a bland antiseptic and the flap sutured with fine black silk. The stitches

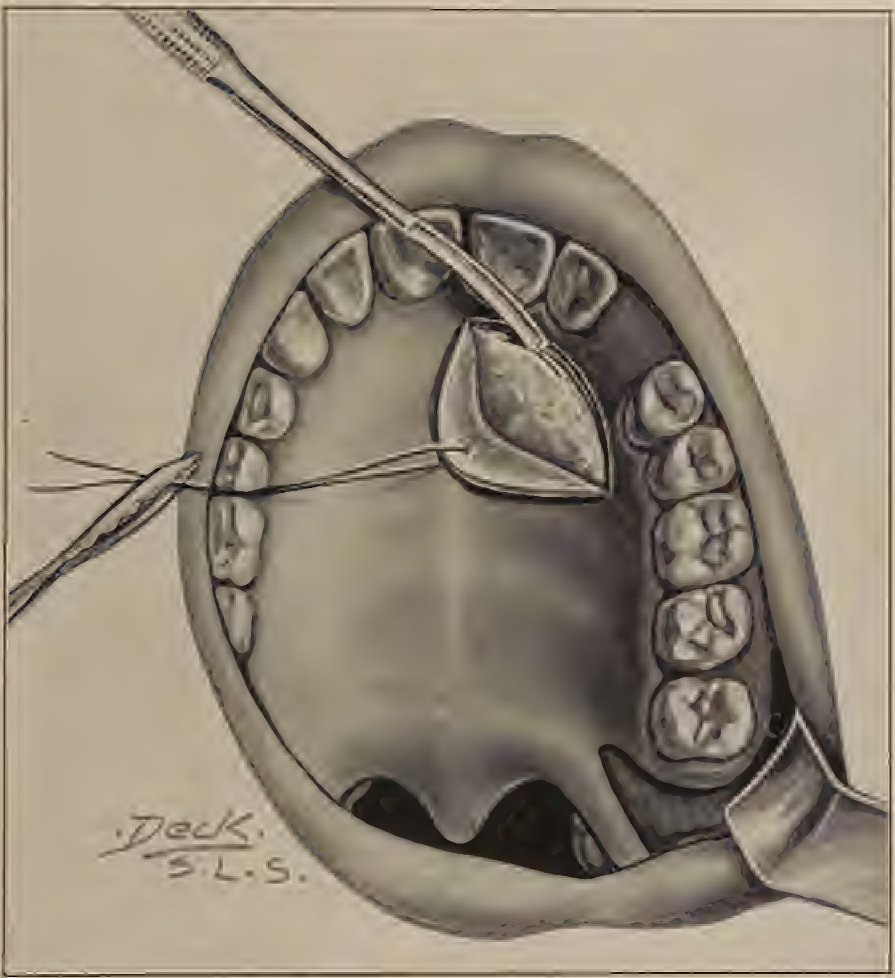


FIG. 189.—Flap is being retracted by suture passed between teeth of right side. Chisel removing overlying bone (Modified from Gardner).

should not be too close together as drainage of the area is to be allowed (Fig. 191).

When the impaction is found to be labial, an incision not unlike the one shown in Fig. 163 is made. The crown portion of the tooth

is cleared of the bone and an attempt made to extract the tooth with a strong pair of bayonet forceps. This is often sufficient to complete the operation. Due to the shape of the root,

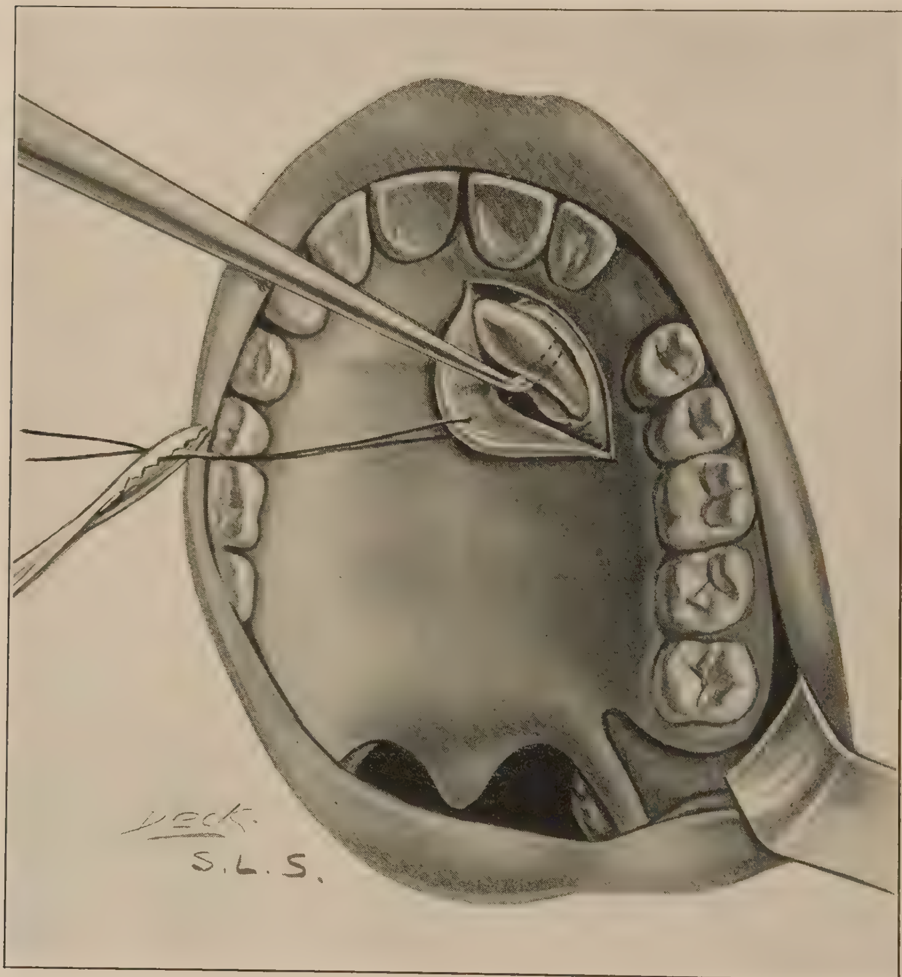


FIG. 190.—Note that the bony palate rather than the surrounding teeth is acting as fulcrum during elevation.

however, the overlying bone along the root of the tooth may have to be chiseled away, but this is not to be dreaded, as it is much safer to remove the resisting bone than it is to risk fracturing the root. The flap is better sutured with fine horse-hair.

At times a cuspid may be found lying in such position that the root is situated palatally and the crown labially. In such instances, one must choose between the two approaches above

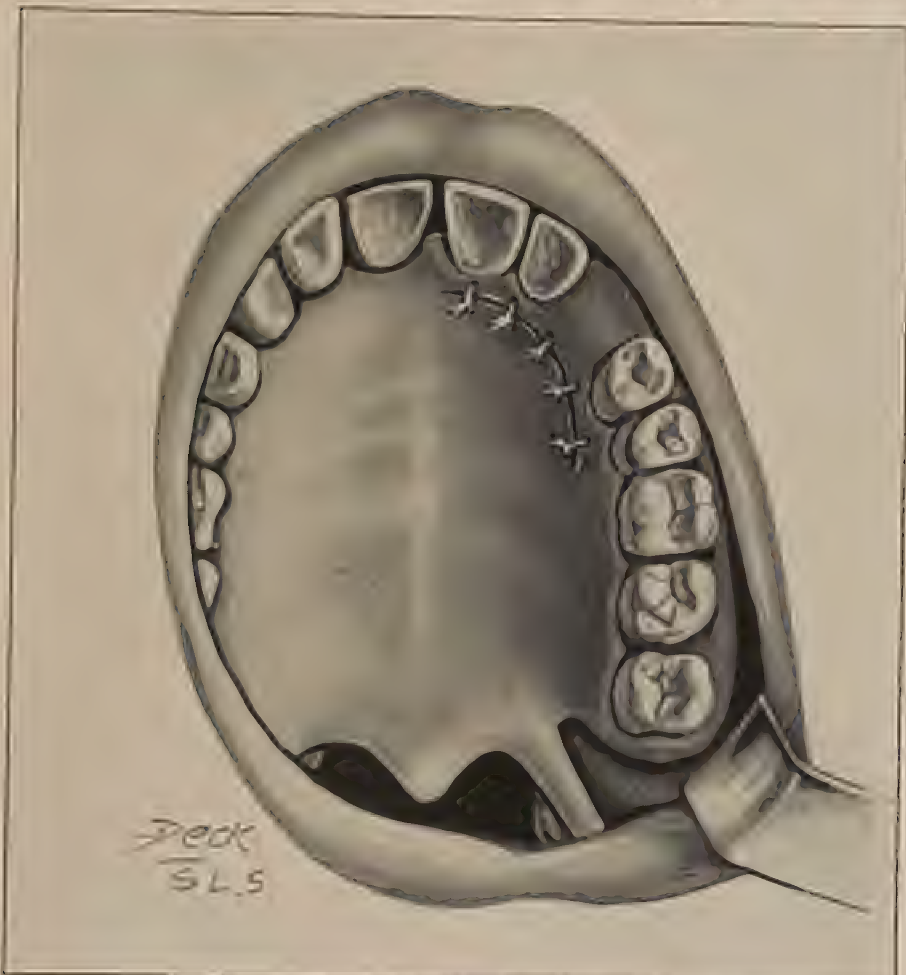


FIG. 191.—Wound sutured.

described. The roentgenogram will predetermine the approach best suited for the removal. Opening up both avenues, that is, the labial and the palatal, for the removal of an impacted cuspid is not to be recommended. Aside from being superfluous, the patient is subjected to a maximum amount of trauma.

In suturing wounds occasioned by the removal of impacted cuspids, the reader is reminded that where the operation is done in infected areas, drainage must be absolutely established by the

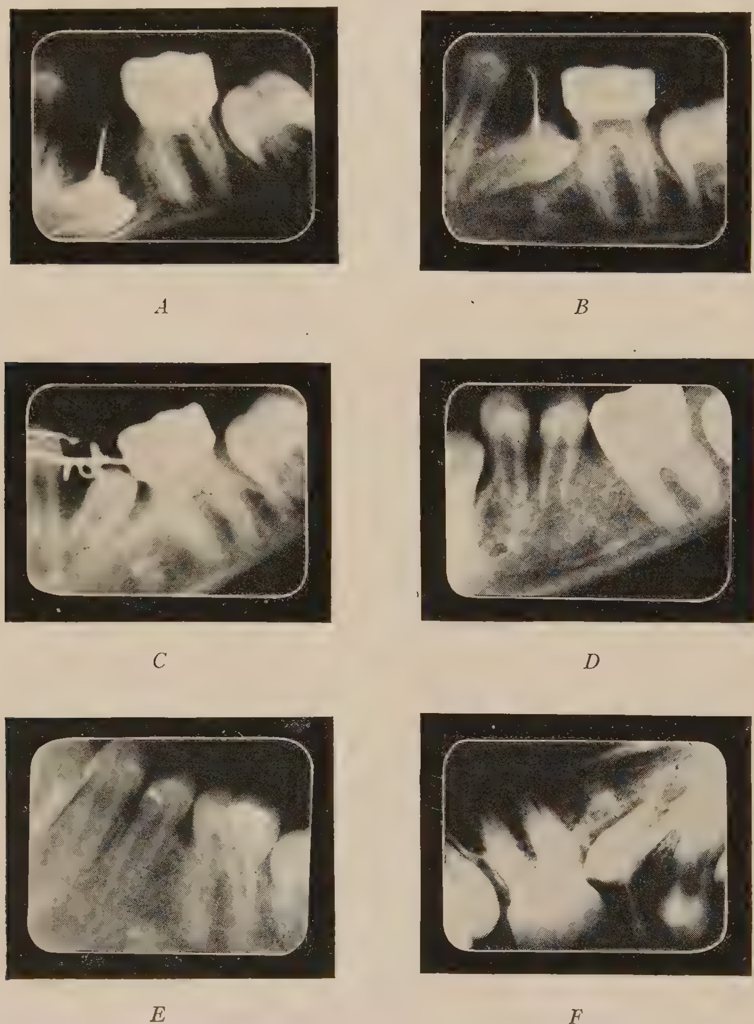


Fig. 192.—Shows how an impacted premolar (figure in upper left) has been brought by stages to normal position (C. C. Howard).

use of a small wick of 5% iodoform gauze. The rest of the wound may be closed with stitches.

Figure 192 shows the orthodontist's ability to bring an impacted tooth into normal position. This procedure is only indicated where the tooth is of sufficient importance.

Other teeth, besides those above mentioned, are occasionally found to be impacted, but their removal does not differ from the technic here described for the common forms.

To sum up the subject of the removal of impacted teeth, it may be well to reiterate: An ample incision, control of hemorrhage, proper retraction, sufficient osseous dissection, and a limited amount of elevation, will convert the bugbear of most dentists into a comparatively easy operation.

This chapter on impactions is not intended to be exhaustive, as that would require a book within itself. It is claimed, however, that by mastering the anatomy involved, plus the careful perusal of the chapters herein dealing with such bone operations as, antrum operations, alveolectomy, jaw excisions, apicoectomy, etc., the reader can prepare himself to a degree where the operation for the removal of an impacted tooth will not be dreaded and bungled.

CHAPTER XXV

CLEFT LIP

Synonyms.—Hare lip, Cheiloschisis.

Definition.—A congenital malformation, characterized by a fissure or fissures of the upper lip.

I have adopted the recent terminology as suggested by Dr. Truman W. Brophy, changing from the time-worn compound term

FIG. 193*A*.—Complete single cleft lip.

FIG. 193*B*.—Same as Fig. 193*A*, 9 months after operation.

hare-lip, to the more scientific term *cleft lip*. "Hare-lip" was so called for its supposed resemblance to the lip of a hare. The cleft, however, in this animal is always in the median line and, therefore, has little resemblance to the malformation found in the human family. Since clefts of the palate are nearly always accompanied by clefts of the lip, it is certainly more convenient and uniform to prefix the term "cleft" before the words "lip" and "palate."

There are various degrees of cleft lip, some consisting of a simple notch, while others are cleft on both sides of the median line, and

FIG. 194*A*.—Complete double cleft lip.

FIG. 194*B*.—Same as Fig. 194*A*, 14 months after operation. Palate has also been closed.

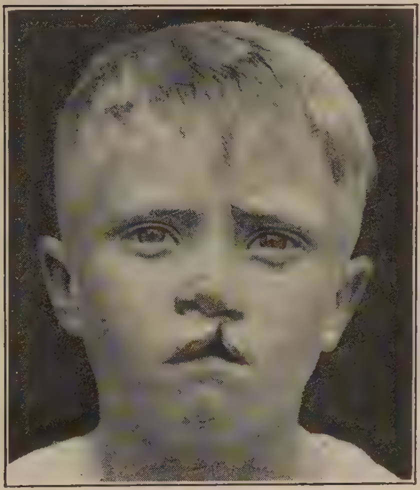


FIG. 195.—Incomplete single cleft lip.

FIG. 196.—Incomplete double cleft lip.

complicated by protruding premaxillary bones and flattened nostrils. Between these two extremes there exist several distinct and

typical kinds; Unilateral or single (Fig. 193*A* and *B*), bilateral or double (Fig. 194*A* and *B*). Incomplete single and incomplete double cleft lip are also common. (Figs. 195 and 196.) Then, too, cases are occasionally seen with double cleft lip complete on one side, and incomplete on the other (Fig. 197). Finally, a very rare type consists of a median cleft (Fig. 198). See Fig. 199 for some of the various types here mentioned.

Fig. 197.—Double cleft lip incomplete on right side (Brophy, "Cleft Lip and Palate," Copyrght P. Blakiston's Son & Co.).

Fig. 198.—Median cleft lip. The growth on infant's head is an encephlocele. Cleft lip at the median line is extremely rare.

The etiology of cleft lip is still an unknown quantity, notwithstanding the various theories that have been promulgated. All that is definitely known on the subject seems to point to heredity, not necessarily from parent to offspring, but from grandparent, great-grandparent, and even further back in the genealogical tree. I have observed one family living in my city, where the first, third, and tenth (the youngest) child had clefts of the soft palate. All other brothers and sisters were normal. In one family of four children, residing in Louisiana, all have cleft lip and palate. Only one case of twins, both affected, has come within my pratice, but I

FIG. 199.—A day's arrival at the Scottish Rite Hospital, Atlanta, Ga.; showing four different classes of cleft lips.

have had several with the deformity present in only one of the twins.

The usual explanation for cleft lip, as given by the laity, attributes the deformity to maternal impressions received during gestation. This is, of course, incorrect, and it need only be remembered that in twins, one may be normal while the other may have a complete cleft of the lip and palate. If maternal impression counted for aught, both of the offspring would be similarly "marked."

Fig. 200.—A 5 weeks old embryo, note the weight exerted on the vertex.

The same objection applies to the theory of malnutrition. Warnekros believes that supernumerary teeth, which are often found between the two halves of a cleft palate, are to blame; Albrecht and Bödecker also base their beliefs on the theory that tooth organs or disarrangement in the premaxillary bone may cause cleft palate. *This, however, in nowise explains* a notch or an incomplete cleft lip, nor a cleft of the uvula. Cryer and Brophy are of the belief that, since the mandible is formed in advance of the maxillae, it, the mandible, in conjunction with the tongue, mechanically prevents the two halves from uniting. Prof. Arthur Keith of England, coincides with Drs. Cryer and Brophy, and on first glance the theory appears plausible, because the position of

the fetus in utero is such as to throw all of the body weight upon the vertex, thus compressing the mandible between the sternal

FIG. 201.—Proximity of thumbs and fingers to the unformed oral cavity and their likelihood of preventing fusion may produce deformities (see text).

region and the ununited maxillae (Fig. 200). The objection to this theory is the same as just given for the theories of Warnekros, Albrecht and Bödecker, namely, the forcing of the maxillae apart

by the mandible, does not explain cleft lip *unaccompanied* by cleft palate. Nor does it explain clefts of the soft palate or uvula unaccompanied by anterior clefts. In fact, I myself, had promulgated a theory, based on Weinberger's assumption that thumb sucking was a prenatal habit, due to the proximity of the thumbs to the mouth of the embryo (Fig. 201). Taking this as a basis, I thought it would be possible for the thumb, or portion of the hand, to become wedged between the ununited maxillae, and thus preclude union. I had no sooner voiced the thought of the possibility of this occurring, when the cleft of the soft palate or uvula, unaccompanied by any anterior clefts, presented itself as an objection.

Treatment.—The treatment for cleft lip is, of course, surgical. The term *cheiloplasty* is at times used to designate the operation for cleft lip. The best time for operating on patients with cleft lip or palate is in early infancy. Years ago, this question was often the cause of disputes, especially between operators of limited experience. One cannot read the works of Dr. Brophy and visit his clinic, without becoming thoroughly convinced that his methods of operating and the time chosen for the operation are, in most cases, absolutely feasible and correct. In this, and the following chapter, a great deal of the material is culled from the various writings of Dr. Brophy, as well as the information gained from personal contact with him. While on the subject of the best age for cleft lip and palate operations, I will here quote from my article recently published under the title, "Reasons for Operations in Early Infancy on Cleft Lip and Cleft Palate."* The article in part is as follows: "Elective surgery, while carrying with it a latitude as to when a given surgical operation should be performed, does not license procrastination to a point where the patient suffers as a result of it. This observation applies especially to Cleft Lip and Cleft Palate. It is surprising that, after Dr. Brophy over forty years ago described his operation on very young infants, and the

* Journal of Ga. Med. Soc., April, 1923.

success that followed it (as proven by a number of us who have done hundreds of these operations), there should still exist those who advocate waiting several years prior to taking operative steps.

"To my mind there are several reasons for early infancy operations, and not a single reason for delay. The only objection raised to operations on a very young infant is a feeble one: It is claimed that operations on an infant under three months is a severe shock to its "nervous system." How preposterous! How can one shock a nervous system, when in the infant it is as yet not developed? An infant does not have the faculty of attention, memory, fear nor apprehension. In short, why take into account a system that does not exist?

"It is noteworthy that infection and shock rarely, if ever, follow circumcisions upon very young infants. This is borne out by the universal practice of early circumcisions among Jews, various states in South America, Central Australians and other people, who hold it as a religious rite. The same good results are to be noted where this operation is performed in early infancy for medical and not religious reasons.

"*A priorily*, one should realize that the trying ordeal and struggle of being born (especially in forceps deliveries) is far greater than that of an operation on the lip or palate; having survived this experience, the risk of the operation is almost nil.

"As to reasons for operating early, let us examine the following: (1) If the operation is done in the first few days or weeks after birth, the infant can begin breast-feeding. (2) The tissues, being semi-embryonic, heal with little or no scarring. (3) The chagrin to parents is not prolonged and later embarrassment to patient avoided. (4) Patient is prevented from acquiring a cleft palate speech. (5) Operative risks are safer in infants than later in life. (6) And finally, but most important of all, when the operation is done under three months of age the jaws being in a pliable state can be moulded with the fingers to the desired shape and wired in

place. After that age, it is practically impossible to bring the cleft jaws together and flaps must be resorted to in order to bridge the cleft. The result in the former brings about a normal arch-contour, while the latter is characterized by a flattened appearance of the face. Dr. Brophy asks the following pertinent question: 'Should a family with a young infant meet with an automobile accident, the mother and child being thrown out of the car with the result to the child of a complete cleft of the lip and palate, the bones being forced apart, would the surgeon suggest postponing operative procedure for a few weeks, a few months, or a few years? Certainly not. He would immediately employ means to bring the separated bones and lips into normal relation . . . So, a cleft palate, not being unlike a wound, calls for measures which have as their aim the closing of this wound—this fissure.'

"If the above is true, it is then a pity that congenital lip and palate clefts are devoid of hemorrhage. It is obvious that should these unfortunate infants be delivered with blood spurting from the clefts, the sight of this might spur immediate correction of the deformity.

"Nausea, a very potent and troublesome factor in adults and children reviving from ether anesthesia, is unheard of in operations on infants. In fact, feeding is started an hour after the operation.

"The pediatrician has been of wonderful help to us with his formulas, and wherever possible the general condition of the little patient is left entirely to him.

"Let us formulate a simple rule for governing the proper time for operating on these unfortunate subjects: Operations for cleft lip of whatever degree, single or double, should be done during the first few days or weeks of life. It accompained by cleft palate the Brophy operation should precede the operation on the lips. *Clefts of the soft palate only, should be operated on between sixteen and twenty-two months of age.* Prior to sixteen months, the soft palate will not

stand suturing. After twenty-two months, we meet with defective speech, which once acquired is most difficult to correct.

"It may be conceded by those who examine the 'before' and 'after' photographs, that the results of my operation on the lips after infancy, are about as good as can be expected (Figs. 202*A* and *B*). To a great extent that is true, but when it comes to the nose, and particularly the palate, the result is, to say the least, poor and compromising. Then, too, these unfortunates were

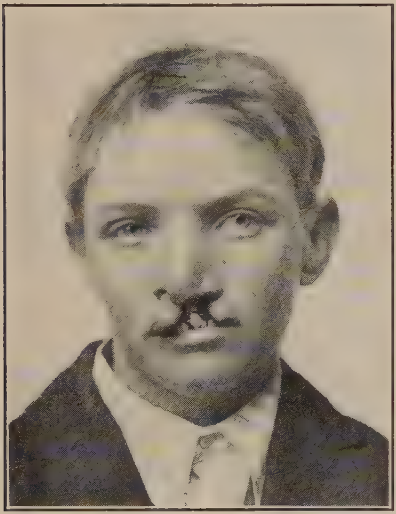


FIG. 202*A*.—Complete single cleft lip and palate.

FIG. 202*B*.—Same as Fig. 202*A*, one year after operation.

unnecessarily social outcasts in juvenile and adult society. The peculiar speech and the hideous appearance, prevented them from enjoying the company of their fellow men.

"Conclusions: (1) Contrary to popular opinion, it is not necessary to wait several months or years to operate on cleft lip and cleft palate. (2) Scars entirely, or almost entirely, fade away in time when operations are done on young infants. (3) The separated bones of an infant can be moved and moulded to their proper positions, whereas in operations on children and adults, flaps must be resorted to which result in broad and flattened faces. (4)

The habit of cleft palate speech, like other habits, is easily acquired but difficult to correct. (5) Shock is not a factor in infants, but is certainly to be considered when operating on children and adults."

Having had the opportunity of observing the results of various operators, and having for experimental purposes used various technics for a sufficient length of time, I have come to the conclusion that in most instances the Brophy operation for cleft palate should be done during the first few weeks of life, followed in six weeks by closure of the lip, and finally, the closure of the soft palate anywhere between the ages of sixteen to twenty-two months.

OPERATIONS FOR CLEFT LIP

The question of the sequence of operation will be further discussed in the next chapter, but before taking up the technic for closure of the various forms of cleft lip, it must be distinctly understood that where the alveolar ridge is cleft, this will first be corrected. Not that the lip cannot be closed without this procedure, but because the anterior palate cleft can best be closed, while the two halves of the lip are open.

No definite rules concerning length, breadth, or height of incisions can be given for the formation of flaps in operations on the lips. This is also true in other plastic restorations, but the principles involved are well shown in the illustrations accompanying this chapter.

There are two methods most popularly employed for correction of single cleft lip, one is after the method of Malgaigne (Fig. 203), and the other suggested by Owen (Fig. 204). The former is well adapted for all incomplete or complete, single narrow clefts, while the Owen type is best suited for very wide and diverging lip clefts (Fig. 205*A* and *B*). It will be observed, that one consists of bringing two flaps together, while the other brings but one flap from the long side which is sutured to the freshened short side.

The patient being anesthetized, the double flap operation proceeds as follows: The lips are dissected free from the bone until

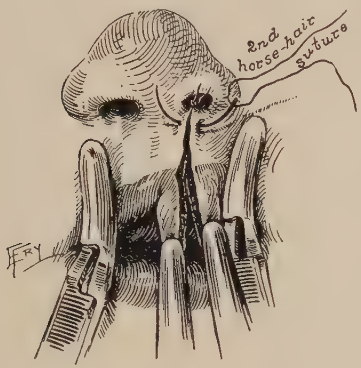


FIG. 203.

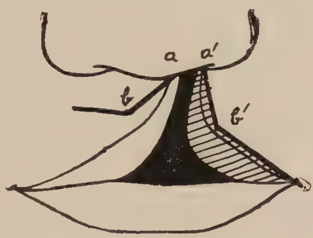


FIG. 204.

FIG. 203.—Malgaigne's operation for single cleft lip (New).

FIG. 204.—Incisions for the Owen operation on complete single cleft lip. Note that the transverse incision is parallel with slit of mouth and *a-b* is equal to *a'-b'* (Blair).

they readily come together without tension (Figs. 206 and 207). With a sharp pointed knife, the incisions to be made are first

FIG. 205*A*.—Unusually wide single cleft lip and palate.

FIG. 205*B*.—Same as Fig. 205*A*, 18 months after operation.

scratched on the skin, thus outlining the plan. The knife then goes through the long right side, holding it in such manner that a

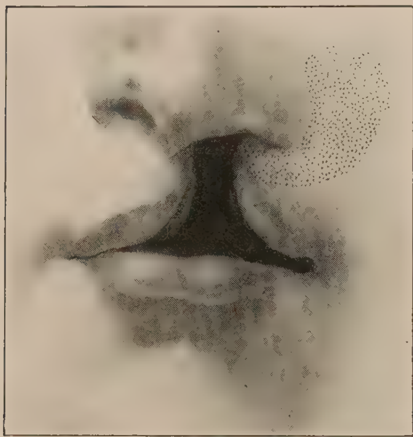


FIG. 206.

FIG. 207.

FIG. 206.—Dotted area illustrates the extent of the incision made to free the tissue in order to bring the flattened nostril into proper position (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

FIG. 207.—Shows the incisions completed and the flaps moved downward, ready for approximation. It will be observed that the mucosa on the long side of the lip extends down lower than on the short side. By this method, mucous membrane is approximated with mucous membrane and skin with skin. No notch is left in the lip after it unites and the central part is pendent. The forceps seize the muscular tissue on the under side of the lip (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

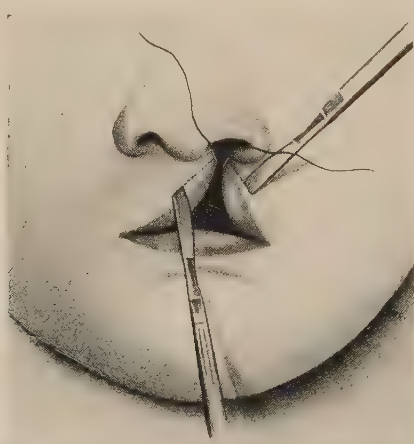


FIG. 208.—Shows the method of making incisions to obtain the correct amount of tissue. The knife on the right side of the fissure cuts in such a manner as to obtain a larger amount of muscular tissue because it is necessary to give the central portion of the lip normal fullness. On the left side a smaller amount is utilized (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

greater amount of mucous membrane will come down to form the thick middle portion of the lip. In bringing the flap from the short (left) side the slant of the knife is reversed so as to bring a minimum of mucous membrane and muscular tissue (Fig. 208). As each flap is brought down, the coronary artery is caught with fine hemostats, care being taken not to include mucous membrane nor skin within the grasp of the hemostats. The edges of the nostrils are freshened and brought together, so that the affected nostril will be on a horizontal level with the normal one. After the

FIG. 209.—Dotted lines mark points for excising superfluous tissue (New).

hemostats have been allowed to check the bleeding arteries for a period of about five minutes, they are removed, excepting those that are holding the ends of the flaps. These ends are always superfluous portions, and no regard is taken of them, as they are to be subsequently removed. The first stitch is usually made with black silk, all subsequent skin sutures are of horsehair. As the surgeon nears the vermilion border, he will find, as a rule, an excess of skin tissue, this is to be removed, or else the lip will be too long (Fig. 209). Care is taken that the vermilion border of one side accurately approximates the vermilion border of the opposite

side. The under surface of the lip is also to be closed, using black silk rather than horsehair. The objection to horsehair in this region is that it incites infants and children to play their tongue against the stiff hair, thus causing early cutting out of the stitches.

If the nostril does not round up to the satisfaction of the operator, a piece of the cartilage may be excised from the under surface (Fig. 210) or the columella may be split as shown in Figs. 211 and 212. These expedients, however, are really intended for secondary operations, following unsuccessful primary attempts. In nearly all cases the nostril can be correctly and satisfactorily shaped at the first operation.

All the stitches in place, it becomes necessary to guard against tension. A very simple, yet effective, contrivance for the relief of tension on the sutures, is shown in Fig. 213 and is known as the Logan Lip Traction Bow. This figure also shows cardboard tubes applied to the arms in order to prevent the infant or young child from disturbing the operated upon field. This method far excels other restraining expedients, particularly those of the straight-jacket type and produces a minimum amount of fretting. Aside from holding the lip in place, I have further employed the bow to hold the nose in position (Fig. 214). It has the advantage of allowing the hospital nurse to clean the stitches without disturbing the appliance. Before removing the patient from the operating table, it is wise to fit a firm plug, made of iodoform gauze, into the nostril of the affected side, and carry it well up into the nose, allowing it to remain in place for several days. This step is of double value; it prevents nasal secretions from running down on the stitches and also, if correctly placed so as to hold the nostril in the desired position, acts as a nostril former.

The Owen operation, for single cleft lip, differs not only in the formation of the flap, but in that it does not require slanting of the knife, as the requirements here necessitate as much mucous tissue as cutaneous and vice versa. Unless one has a wealth of clinical

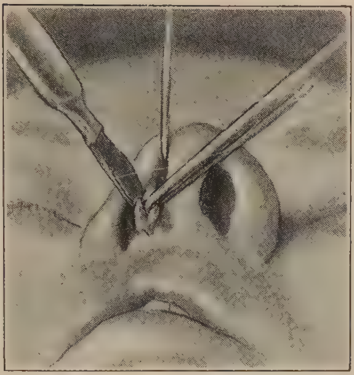


FIG. 210.—Manner of removing section of cartilage to give nostril normal form (Brophy "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

FIG. 211.

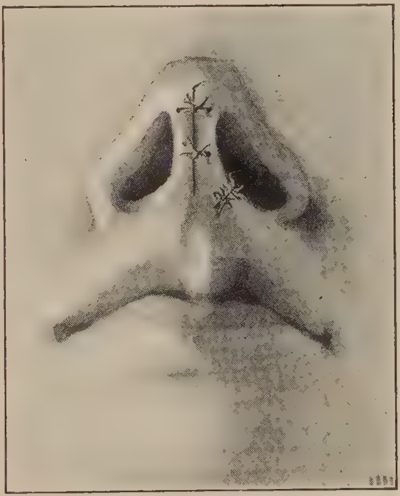


FIG. 212.

FIG. 211.—Splitting columella to elevate nose, and removal of a V shaped piece of the base of the nostril to correct flare and size (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

FIG. 212.—Same as Fig. 211 showing completed operation (Ericsson after Brophy).

FIG. 213.—Logan's lip traction bow applied to nose and lip. Illustration also shows cardboard cuffs applied to arms and pinned to gown at the shoulders. This allows arm motion in all directions excepting bending at the elbows and thereby prevents the infant or child from disturbing the operated upon field.

material, it would probably be best to master one method of lip closing rather than to attempt to employ several methods. The Owen operation, with slight modifications, can oftentimes be

FIG. 214.—Logan bow holding nose in place. Stitches have as yet not been removed.

FIG. 215.

FIG. 216.

FIG. 215.—Rose operation for single cleft lip (Brophy, "Cleft Lip and Palate," CopyrightP. Blakiston's Son & Co.).

FIG. 216.—Operation admirably suited to remove unsightly notches and scars following previous operations. By the vertical dotted lines it is seen that the incisions extend laterally as far as the widest part of the cleft. It will also be seen that the length of each cut within the vermilion border of the lip is the same. If the lengths of the two curved incisions were measured, it would be found that they were of the same length on each side (Brophy "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

utilized to good advantage. The Rose operation, consisting of semicircular preparations of the edges of the cleft (Fig. 215) is

not to be recommended, because it leaves the upper lip tight and smaller than the lower. A modification, however, of the Rose operation, is probably the best method we have of correcting previous operations on lips which have resulted in unsightly notches, scars and flattened nostrils (Fig. 216).

OPERATIONS FOR DOUBLE CLEFT LIP

The operation for double cleft lip is a more difficult one than those just described for single cleft lip. Results, however, are

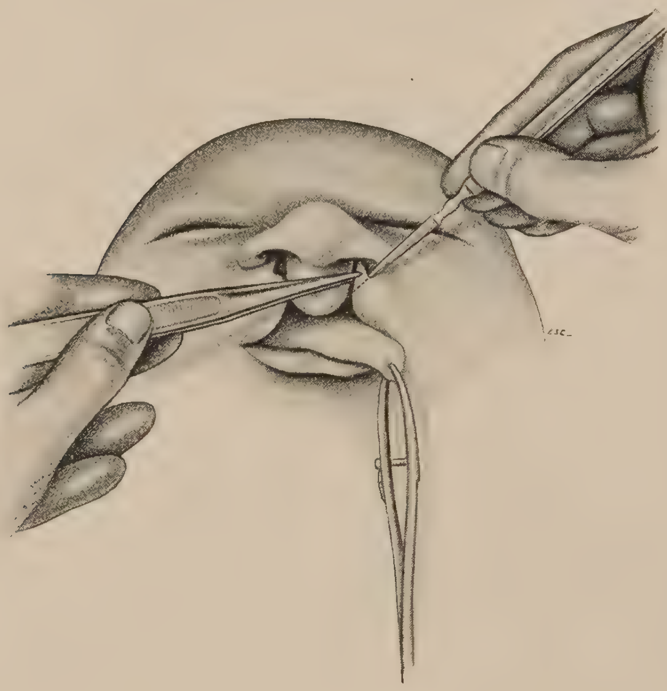


FIG. 217.—Incision used in correcting flattened alae of the nose in single or double cleft lip operation. The tongue is held forward to prevent it from dropping back into the pharynx and obstructing respiration (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

satisfactory, providing the principles involved are understood. It will be seen in Fig. 194*A* that the central portion of the lip, which carries most of the philtrum, is not long enough to come in contact with the lower lip. Any attempt (as recommended by

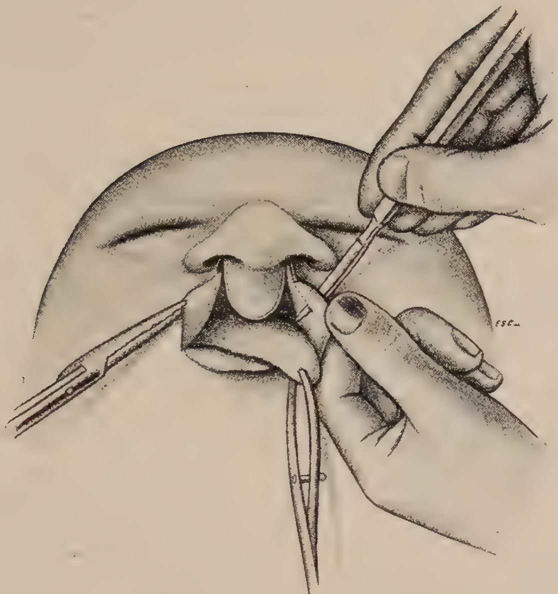


FIG. 218.—Proper position of knife in making flap. The mucous surface is shown here (B rophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

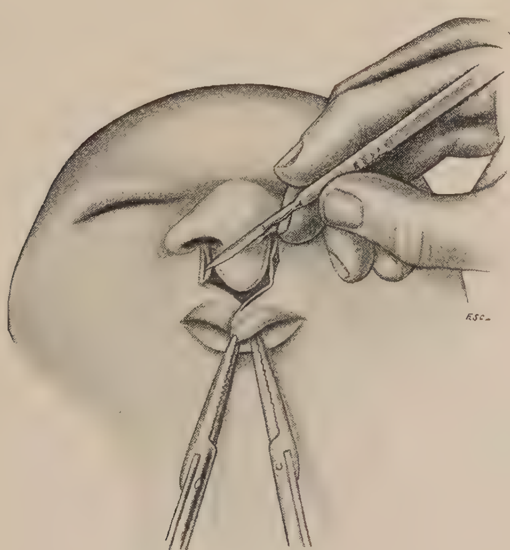


FIG. 219.—Flaps held in position by forceps. The freshened surfaces have been split, so as to avoid the formation of grooves in the skin (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

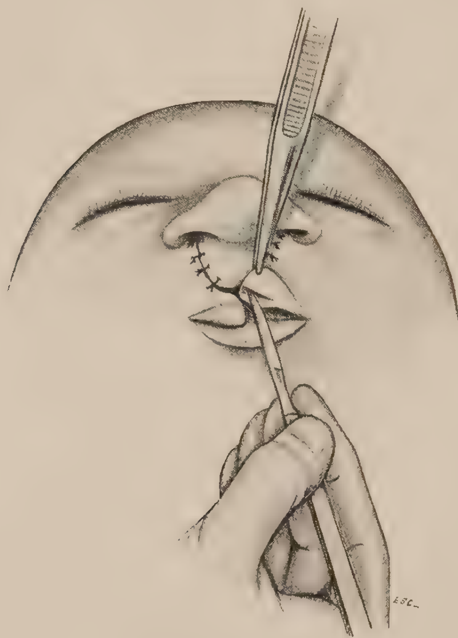


FIG. 220.—Incision used to give proper fullness to the center of the lip (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

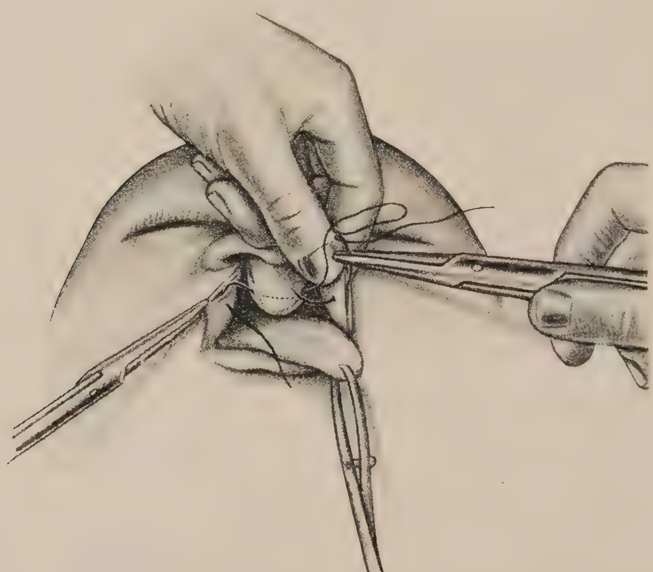


FIG. 221.—Temporary suture used to hold separated tissues together while introducing the lip sutures (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

some authors) to *stretch* this portion of the lip, and sew it to the longer lateral portions, is bound to result in failure. Since the

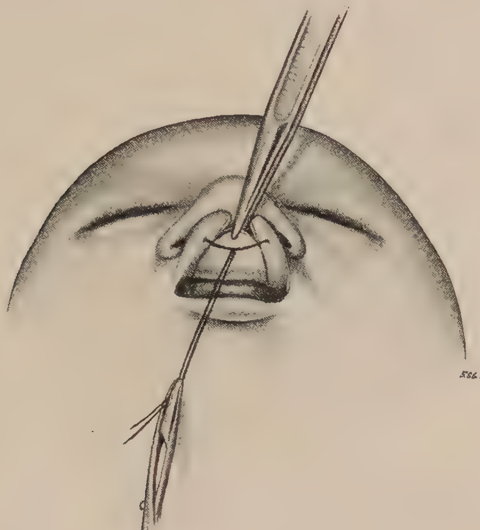


FIG. 222.—Temporary suture tied and separated tissues brought in contact (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

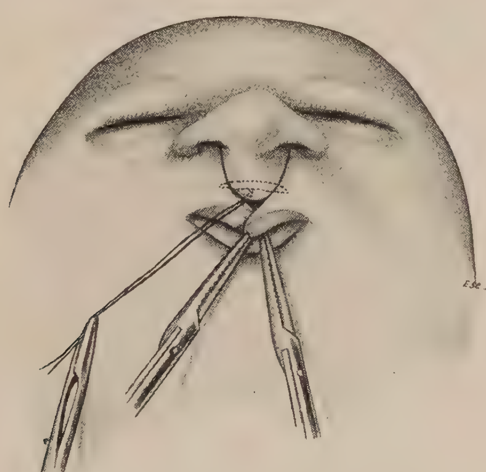


FIG. 223.—Skin surface of lip showing tissues brought in contact and temporary suture beneath (dotted lines) (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

central portion needs a more cutaneous length, as well as mucous tissue, the flaps that are brought from either side are designed to

furnish these deficiencies. Figures 217, 218, 219, 220, 221, 222, 223, 224, 225 and 226 very ably show the various steps.

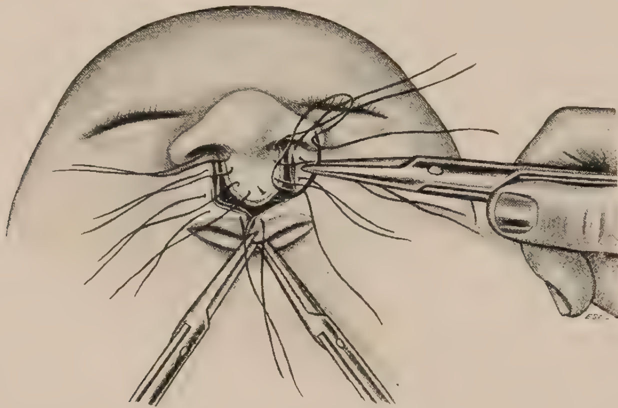


FIG. 224.—Method of introducing interrupted horse-hair sutures. Small hemostatic forceps used to secure correct relation of edges of the lip (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

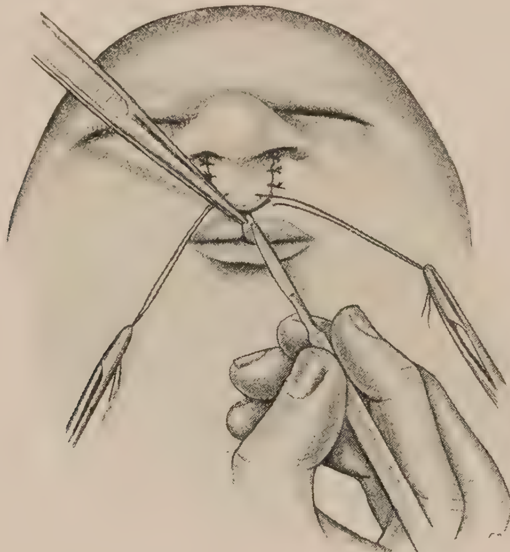


FIG. 225.—Method of removing superabundant skin on flap to prevent the overlapping of mucous membrane. This insures contact of skin with skin and mucous membrane with mucous membrane. All the muscular tissue should be preserved and used to give to the lip normal fullness and to prevent notch. The skin and mucous membrane may be sutured over the muscular tissue to accomplish this end (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

Of utmost importance is the dissection of the two halves of the lip from the underlying maxillae. The knife is first used to

remove the mucous tissue, throughout its whole thickness, from the central portion of the lip, and hemostats applied to control

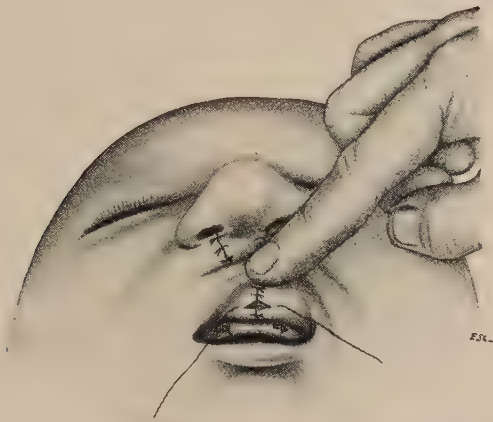


FIG. 226.—Method of joining mucous membrane in the mouth (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

hemorrhage. Flaps are then brought from either side, the knife slanting so as to bring down a maximum amount of muscular

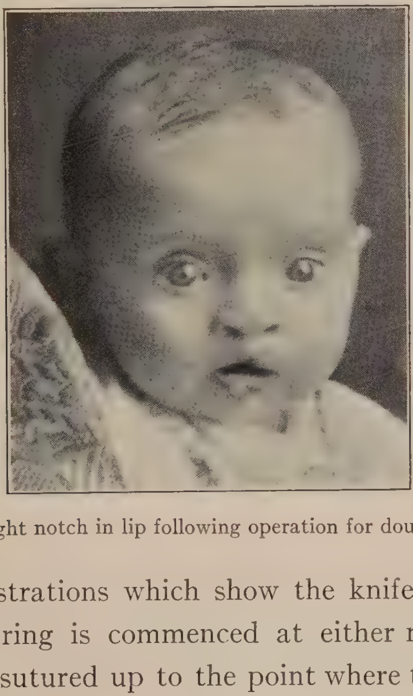


FIG. 227.—Slight notch in lip following operation for double cleft lip.

tissue. (See illustrations which show the knife cutting the *right* side flap.) Suturing is commenced at either nostril until both sides have been sutured up to the point where the two vermilion

borders are to be united. The first stitches in each nostril are of black silk all other cutanecus stitches are of horsehair, while the

FIG. 228*A*.—Complete single cleft of lip and palate.

FIG. 228*B*.—Same as Fig. 228*A*, following operation.

FIG. 229*A*.—Single cleft lip (patient partially anesthetized).

FIG. 229*B*.—Result of operation on case shown in Fig. 229*A*.

mucous membrane, as in the operation for single cleft lip, is to be closed with black silk. At this point, it becomes necessary to try

FIG. 230A.—Wide lip cleft and cleft of palate.

FIG. 230B.—Same as Fig. 230A after operations.

FIG. 231A.—Cleft lip and absence of premaxillae.

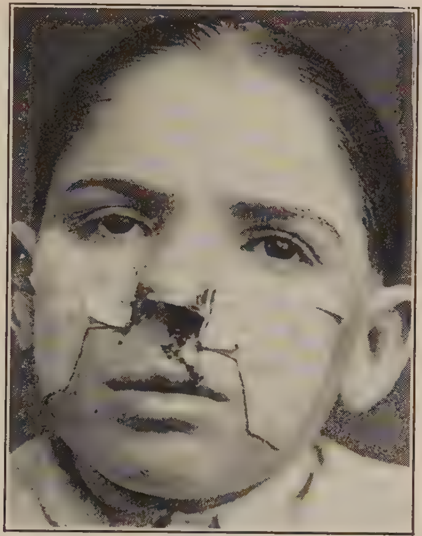


FIG. 231B.—Same as Fig. 231A, 4 days following operation. Gauze plug in left nostril.

the flaps against each other. In most cases some of the skin tissue will have to be removed, or else the lip will be too long. (If the flaps are made too short, there will be a notch at the median line Fig. 227.) Having removed the excess skin tissue, it will, at times, be necessary to split the flaps, as shown in Fig. 220, in order to have sufficient fullness at this portion of the lip. The vermilion borders are accurately approximated. As in the case of single cleft lip, the ends of the flaps, held by the hemostats, are to be cut off, as they can be of no service. Two to four sutures of black silk are placed on the under surface of the lip. (See Fig. 226.) Iodoform gauze plugs (see operations for single cleft lip) are inserted and the Logan Lip Traction Bow is applied (Fig. 214). Figures 228*A* and *B*, 229*A* and *B*, 230*A* and *B* and 231*A* and *B* show several of the writer's completed cases.

In operating upon incomplete single or double cleft lip, it is best to *surgically complete the cleft*, otherwise a great deal of difficulty will be experienced in procuring a pleasing result. While this does not apply to all cases of incomplete cleft lip, it does apply, without exception, in all cases where the nostril, or nostrils, are spread and flaring.

After Treatment for Operations on Cleft Lip.—Clots and crusts are not allowed to remain along the line of suture for any length of time. A small sponge (not cotton) held in a pair of hemostats, is dipped into a boric acid solution and the stitches cleaned. In some cases, this is needed only once in twenty-four hours, at other times the suture line may need attention five or six times during the same period. If sutures are not tied too tightly, they may remain for five to seven days before being removed. Some operators tie too tightly and as a consequence the sutures must be removed about the third or fourth day.

For preparation of the infant patient, as well as methods of feeding, etc., see chapter on Cleft Palate.

Secondary Operations for Cleft Lip.—Due to faulty operations (such as improper incisions, ill-planned flaps, and lack of control

FIG. 232*A*.—Profile of patient showing loss of premaxillae.

FIG. 232*B*.—Same as Fig. 232*A*. Note incisions for correction.

FIG. 233.—Incomplete V flap has been transferred to upper split lip. See text.

of tension) clinics are often more occupied in correcting the primary mistakes of others than in handling unoperated-upon cases. The

most serious mistake met with in this type of surgery is where some surgeon, unaware of the importance of the central portion of the lip and the underlying premaxillae, removes them with one fell swoop, little dreaming that the results will be as depicted in Fig. 232*A* and *B*. The premaxillae having been lost, it is not an easy matter to correct the mistake, but the loss is not entirely irreparable. Figure 232*B* shows the vertical incision dividing the upper lip through and through; also the outline of the flap taken from the lower lip, as suggested by Estlander. This incomplete V incision

A *B*

FIG. 234*A*—*B*.—Same as Fig. 232*A* and *B* several months after operation.

is inverted and sewn to the upper lip. The pedicled flap contains the right coronary artery. The mouth is sewed together so as to prevent the stretching of the pedicle. Only a small opening is left for the introduction of a glass drinking tube (Fig. 233). At the end of ten days, the flap is released from the lower lip and the latter closed. The mouth is now rather small and requires slitting at the corners. This is easily done and, in order to prevent rehealing, the mucous membrane is brought forward and sutured to the fresh cutaneous border. This case is particularly baffling in as much as no teeth, deciduous or permanent, are present in the upper

FIG. 235.—Notch following ill planned incision (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

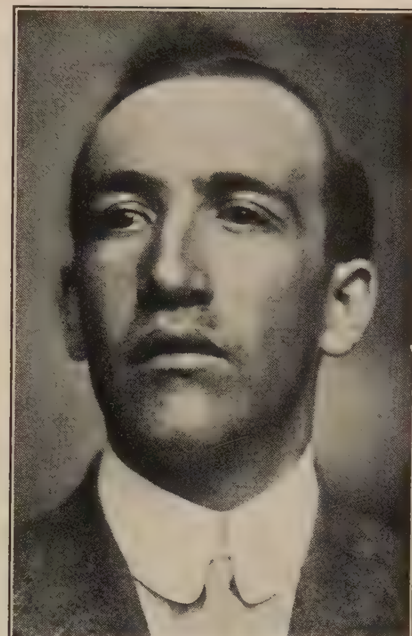


FIG. 236.—Same as Fig. 235 after operation (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

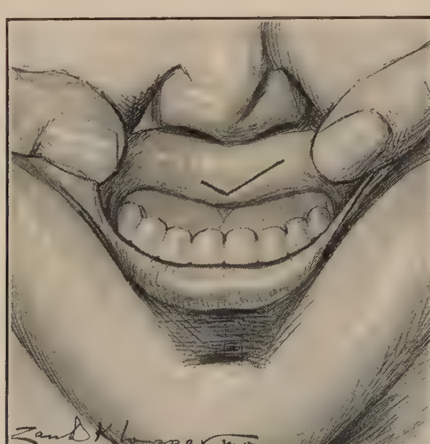


FIG. 237.—If the notch is on the left side, as is usual, the incision should be longer on that side since a greater amount of tissue must be lifted to overcome the defect (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

jaw. Consequently, prosthesis can not be made at this age—ten years (Fig. 234*A* and *B*).

Figures 235 and 236 show a poor result in a case of single cleft lip, and the correction by a second operation. See Figs. 211 and 212 for correcting a flattened nostril by removing a portion of the cartilage.

In cases where the cutaneous portion of the lip is full and sufficient, but where a notch is present in the mucous portion of the lip,

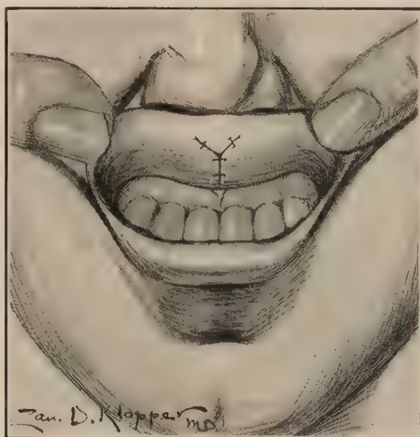


Fig. 238.—Shows manner of introducing sutures. The notch is thus removed (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

it may be lengthened by everting it and making a V shaped incision (Figs. 237, 238). This incision is carried through, fully two-thirds of the thickness of the lip, and the V is converted into the letter Y by suturing.

Sponges wrung out of water at 160°F. will control the capillary hemorrhage. Fine pointed hemostats are, of course, used to control arterial flow from the coronary arteries.

CHAPTER XXVI

CLEFT PALATE

Synonyms.—Uranoschisis (cleft of hard palate) Staphyloschisis (cleft of uvula or soft palate) Uranostaphyloschisis (cleft of hard and soft palate).

Definition.—A congenital malformation characterized by a fissure or fissures through the hard or soft palate, or both.

Symptoms and Diagnosis.—In cleft lip associated with cleft palate the diagnosis is so obvious that it needs no description. In cleft of the soft palate *alone*, however, the condition may go unnoticed until the typical cleft palate speech is noticed, about the age of two and a half years. One cardinal sign of soft palate clefts in infants is the escape of fluids through the nose when the infant attempts to nurse. The crying sounds of a cleft palate infant are not to be distinguished from those of a normal one.

To Dr. Truman W. Brophy of Chicago is due the credit for popularizing operations in early infancy; a procedure much feared and maligned in the early days. To him, also, goes the credit for having suggested most of the helpful technic and appliances, and for having, in a general way, added more to the subject of Cleft Palate than any operator past or present. His ideas and technic, to a great extent, being original, his views were far from being generally accepted. Year by year, however, one can observe more and more operators following the teachings of this great surgeon. As will be noticed a goodly part of this book may lay claim to originality, at least as to illustrations, but when it comes to the subject of Cleft Lip and Palate, an author can do no better than utilize Dr. Brophy's material, as he has fully covered the

FIG. 239.—Forms of cleft palate (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's

subject in a monograph recently published (Cleft Lip and Palate, Brophy, Blakiston, 1923).

Brophy has classified fifteen different forms of cleft palate (Fig. 239) but I have recently operated on one that could easily classify as the sixteenth (Fig. 231*A*). Drs. V. P. Blair, M. N. Federspiel and Hugh MacMillan, who witnessed the operation,

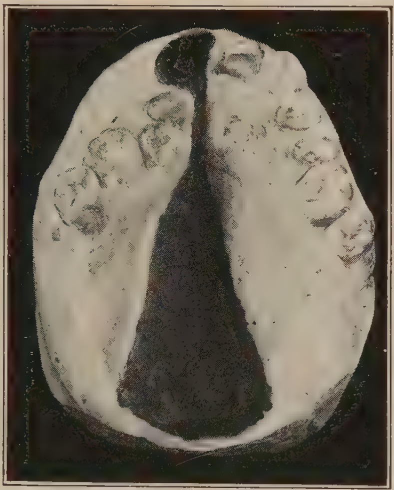


FIG. 240.—The long side protrudes beyond the short side, as it usually does, adding to the deformity. Had the edges of the cleft been freshened and correctly approximated in early infancy, a normal arch would have been produced. The condition here is not unlike an un-united fracture. The treatment should be based upon the same principles. Correct bone surgery should have been practiced early, which would have produced a normal arch, a useful palate and would have prevented this deformity.

The posterior part of the cleft has been widely separated by closing the lip and partially closing the anterior part of the cleft. The bones do not meet. If they did, they could not unite because of the intervening mucoperiosteum (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

agreed that it was a case of single cleft palate with the inter maxillary bones missing.

No satisfactory etiological explanation has as yet been offered for the cause of cleft palate. (See etiology of cleft lip.)

The treatment for the various types of cleft palate is, of course, surgical, excepting in inoperable cases, which fortunately are extremely rare. In those cases, and in those only, should obturators be employed.

It is regrettable that some surgeons are content to only close the lip. They claim that the pull of the lip will bring the anterior portion of the maxillae together; and that only the soft palate

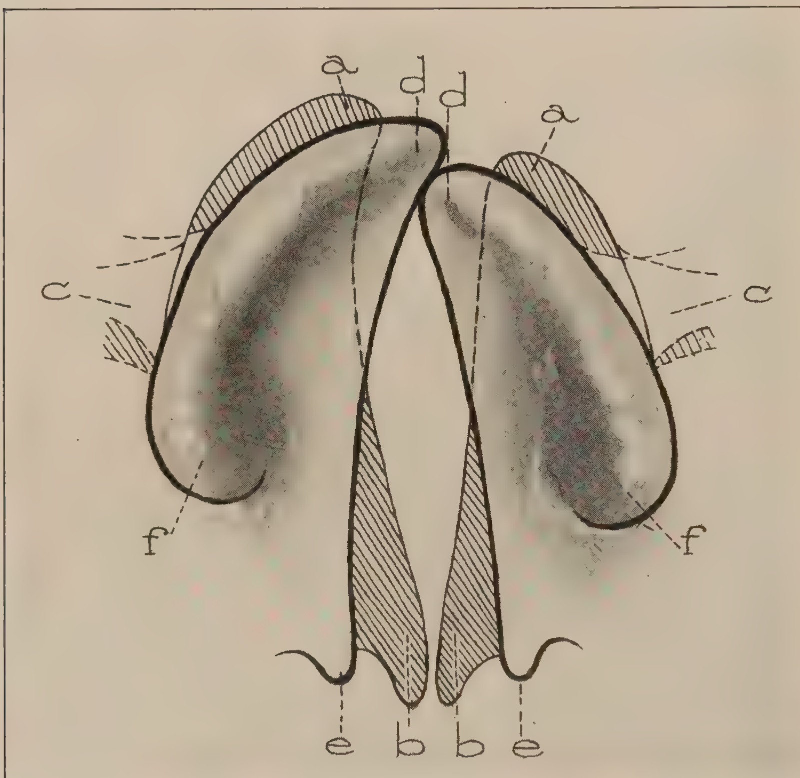


FIG. 241.—Drawing showing change in position of the palate and alveolar processes due to either contraction of the orbicularis oris muscle after the lip operation or the result of moving the anterior alveolar processes together. *a.a.*, Bones widely separated at birth. *b.b.*, Posterior part of cleft at birth. *d.d.*, Anterior part of cleft after alveolar processes are moved together, but not united. *e.e.*, Posterior part of cleft has widened. As the anterior part moves together the posterior part separates. *c.c.*, The malar processes, the pivots upon which the leverage is exerted to move the posterior parts outward while the anterior parts are moved inward. *f.f.*, The tuberosities widely separated as the result of failure to move them together or to prevent them from separating (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

will need surgical closing. The lip pressure on the cleft maxillae is not uniform, the long side receives all or nearly all of the force, and as a rule the result is far from what was hoped for (Fig. 240).

Then too, as Brophy has clearly shown, this procedure causes widening of the space between the maxillary tuberosities (Fig. 241).

The usual objections to the Brophy operation for cleft of the alveolar portion of the hard palate, and my comment on them are as follows: *The infants whose bones are pliable enough (under six months of age) will not stand the surgical shock.* Comment: Not having a developed nervous system, shock is impossible. Mortality rates in Chicago and Atlanta hospitals are less than 2%. When it is realized that this death rate includes deaths from any and all causes while the patient is under observation, and that the death rate in normal infants is as high, or higher, the figures seem to have been purposely falsified. The explanation, however, is very evident if it be remembered that a normal infant may be at the mercy of well intending but ill-informed parents and neighbors, and is subjected to a great deal of empirical feeding and treatment. Whereas, in a hospital, the experienced pediatrician, nurses and dieticians all cooperate in the scientific care of the patient.

Sloughing or necrosis is likely to result following the use of the silver wires and lead plates. Comment: This can only happen to operators who have not learned the technic and, therefore, are inserting the wires too near the occlusal surface of the alveolar ridge. Since hospital records are now compulsory, and open to inspection, it can easily be ascertained whether or not a single case of sloughing or necrosis followed a Brophy operation!

The tooth buds are likely to be injured by the needles passing through the substance of the bone, thereby interfering with their eruption, and contributing to irregularities of the teeth and jaws. Comment: In cleft palate cases that have not been operated on by the Brophy method and, in fact those that have never been operated upon at all, the dentition is always defective or faulty, especially the teeth near the cleft borders. But, granting this objection, it should be apparent that dental irregularities which have devel-

oped in lieu of the horrible facial and palatal irregularities, are a good exchange.

Recently it has been claimed that the premaxillary bones in a double cleft palate when forced to position and wired by the Brophy method will cause the lower teeth to occlude in front of the upper. Comment: If the premaxillary bones are not forced too far back this will not result, but should it result, the orthodontist has shown his ability to correct this condition in early childhood or youth; while in adults the prosthetist can first extract the faulty upper teeth and supply a satisfactory artificial substitute. I am firmly convinced that the removal of the premaxillary bones, or the teeth of same, in infancy or childhood, with the idea of producing a prosthetic restoration in later life, will, in time, cause a great deal of mischief. It must be remembered that the force exerted by a tight upper lip, will interfere with the results an orthodontist or prosthodontist might expect.

Time for Operation.—All infants born with a cleft palate which involves the alveolar process (forms seven to fourteen inclusive), should have the hard palate (not the soft) operated upon during the first six months of life; preferably during the first three months. All clefts of the soft palate, whether occurring alone or in company with cleft of the hard palate, cannot be operated upon successfully until the infant is about sixteen months old. The ideal time for operating on the soft palate is placed between sixteen to twenty-two months of age.

A patient older than six to eight months does not easily lend itself to the Brophy operation and, therefore, the surgeon may have to wait until the infant is about twenty months old before he can utilize the Langenbeck operation.

Preparation of Infant for Operation.—Wherever possible, the pediatrician on the hospital staff should be called on for examination of the little patient. The formulas for feeding are left entirely

to him and, contrary to popular belief, the infants seem to thrive on the human milk substitutes, as is evidenced by the various photographs shown in this book of the cases coming under my observation.

The very young infant (a few days to three months of age) is not to be fed for two to three hours before operation. Infants older than above should not receive any food for four hours prior to operation. No other preparation is practiced, except the alkalinizing of the patient in the event of acidosis, and an enema for constipation. Ether vapor anesthesia by use of the electric vaporizer is the most satisfactory method so far found. *Profound anesthesia is to be avoided.* An occasional whimper from the patient should not fret the operator, as it is much safer to operate on very young infants under an anesthesia that just divides the second from the third stage of ether anesthesia, than it is to carry them past the state of surgical anesthesia.

Operation for Cleft Palate.—*Uraniscorrhaphy* and *uraniscoplasty* are names used to denote operations on the hard palate. *Staphylorrhaphy* and *Staphyloplasty* are terms applied denoting operations on the uvula or soft palate. These terms are, however, rarely used.

In describing the technic for operations on infants, it will only be necessary to describe the operation for single cleft palate (form seven Fig. 239); the operation for double cleft palate (form eight Fig. 239); and the operation for cleft of the soft palate with but a slight cleft of the hard palate (form six Fig. 239). Having mastered these three operations, the other forms will not be difficult of management.

Technic of the Brophy Operation for Form 7.—The right lip and cheek are retracted, and a straight Brophy needle carrying doubled braided silk is forced through the jaw as high up in the fornix as possible. The point of entrance is just behind the malar process. The needle point must go *over* the palate bone and when

it is seen to emerge in the cleft, a tenaculum (hook) engages the silk, and the needle is then withdrawn (Fig. 242). This is repeated at the corresponding point on the left maxilla. It will be noticed that the right side is usually the longest side, that is, it carries the premaxillary bones. The long side will carry three pilot sutures, while the short side will only carry two. Figure 243 shows all pilot sutures in place and also shows how the sutures

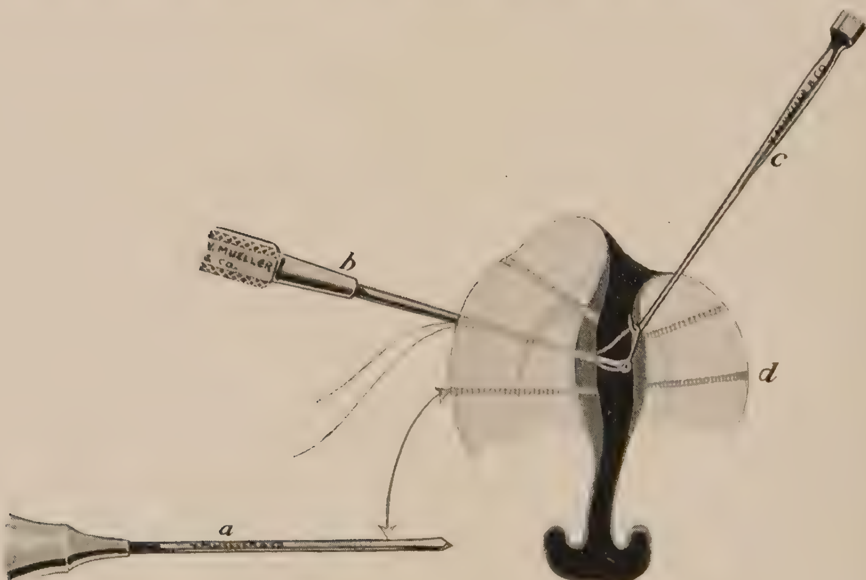


FIG. 242.—Method of introducing braided silk sutures by the use of straight needles. Teneculum engaging the silk in fissure (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

from the short side have been engaged in the loops of the other side. When traction is made on the sutures of the right side they will pilot through the ones of the left. A single suture then results, which is in turn used to pilot through the doubled silver wire, gage 18 (Fig. 244). It will be noticed that one limb of the anterior wire of the left side is pulled on just enough to retrieve it in the fissure, the end is then bent, and the anterior pilot suture used to bring it to the buccal surface of the right maxilla (Fig. 245). All wires are now in place, and are numbered in this illustra-

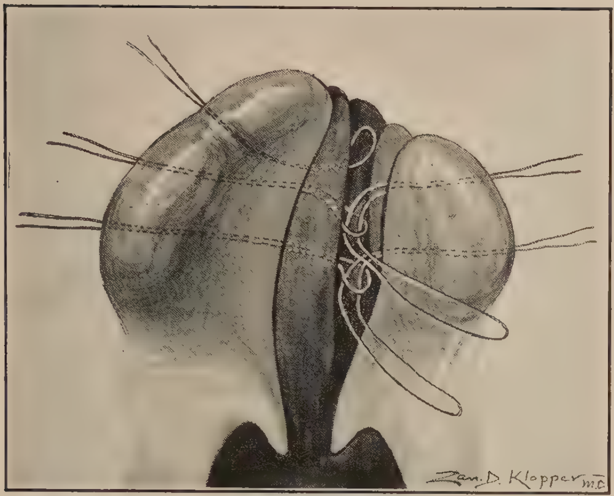


FIG. 243.—Pilot sutures all inserted (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

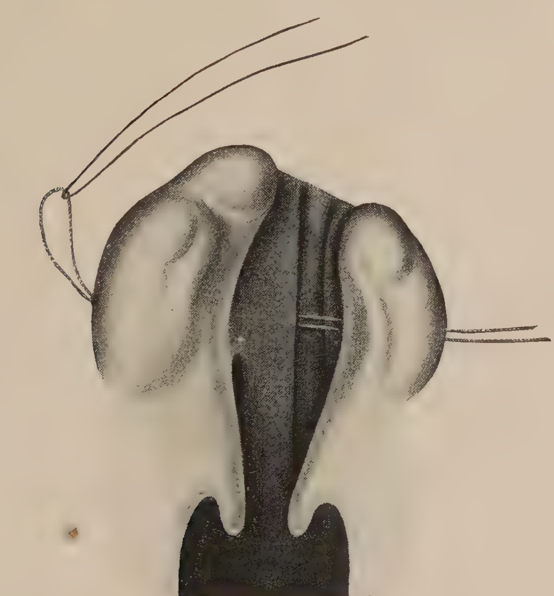


FIG. 244.—Pilot suture of silk has been introduced and silver wire is shown passed through the loop in the pilot suture. By pulling on the silk, the silver wire is drawn into place. After this the loop in the silver wire is cut, thus giving two sutures (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

tion so as to facilitate the reader in understanding what follows (Fig. 246). Two lead plates 16 gage, one with three holes, the

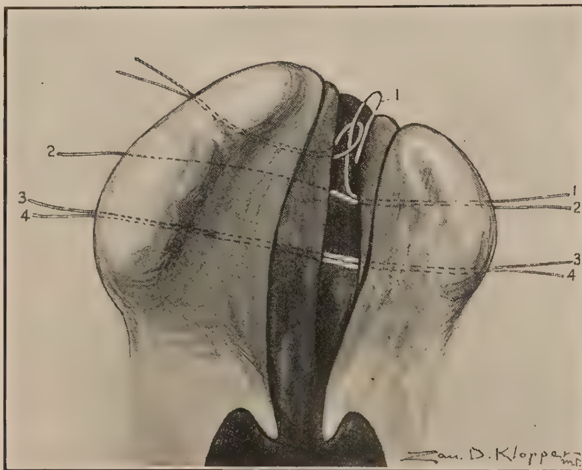


FIG. 245.—One of the anterior double wires (1) withdrawn from the long side of the bone and passed through the loop of the anterior pilot suture (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

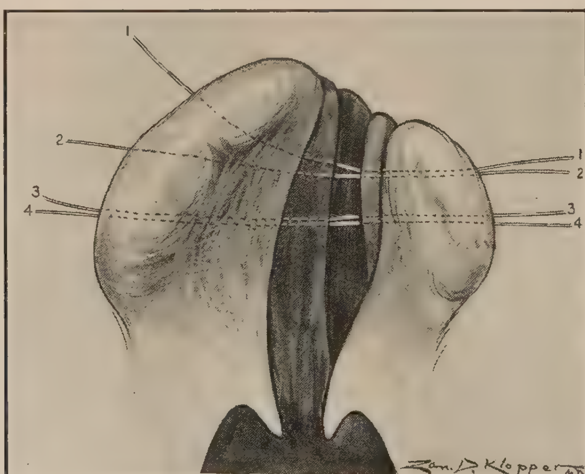


FIG. 246.—Silver wires in place (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & CO.).

other with two holes (Fig. 247) are then placed over the wires and conformed to the jaws. The wires are then twisted together. The purpose of the lead plates is to prevent the wires from cutting into

the buccal surface of the jaws. Wires 2 and 3 are twisted together on the left and right side, then wires 1 and 1, are twisted together and finally wires 4 and 4 (Fig. 248).

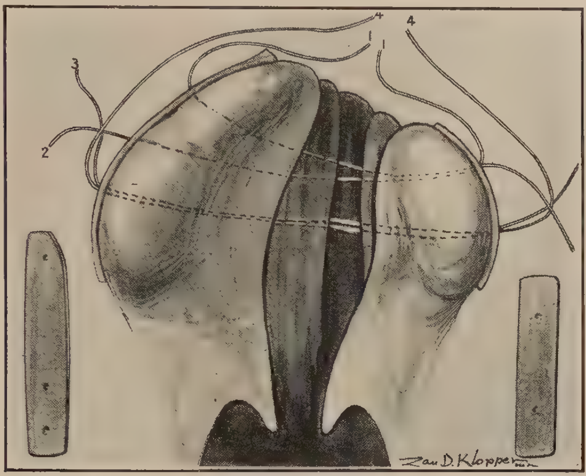


FIG. 247.—Wires and plates in position. The method of fastening the wires is shown by numbering each end. Right and left lead plates are shown (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

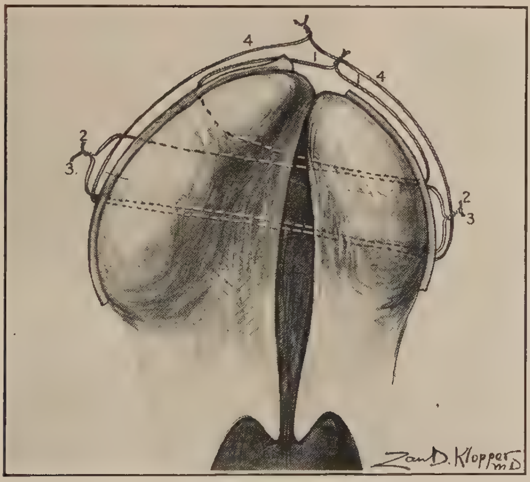


FIG. 248.—Twisting of wires completed (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

If the illustrations are examined carefully, it will be noticed that wires 2 and 3 are the only ones that move the maxillae cen-

trally, while the other wires are brought around to the front and are used to form the alveolar arch. Prior to tightening the last mentioned wires, a sharp bone file (Fig. 249) is used to freshen the approximating surfaces. In order to obviate a notch at the

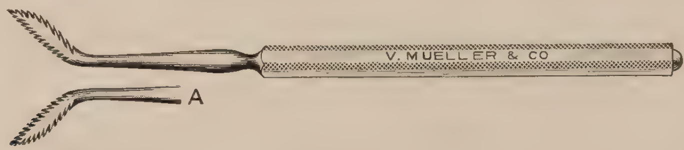


Fig. 249.—Instrument for scarifying ends of maxillae (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

point of union, two small flaps, one from either side, are brought down and sutured (Fig. 250). Figure 251 shows an infant's head, in cross section, which depicts the wire sutures and lead plates in place. At the end of six weeks the wires and lead plates

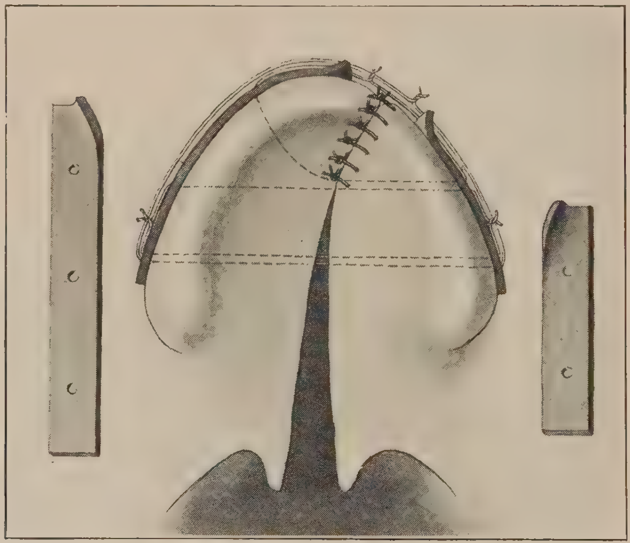


Fig. 250.—Wires twisted and anterior portion of cleft sutured (Brophy, "Cleft Lip and Palate," Copyrigh P. Blakiston's Son & Co.).

are removed. The infant's mouth needs no especial treatment, aside from that of keeping the parts clean with a boric solution on a suitable sponge. (See end of this chapter for correct technic of twisting wires.)

FIG. 251.—Sagittal section of skull showing wire sutures in place. Edges of cleft are approximated (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

FIG. 252.—Form 8. Tripartite cleft, extending through the soft and hard palates and the alveolar processes, separating the premaxillae from the maxillae. Nearly always complicated with double cleft lip (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

FIG. 253.—Illustrates Esmarch and Kowalzig's method of moving the premaxillae backward. The vomer is incised and telescoped backward (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

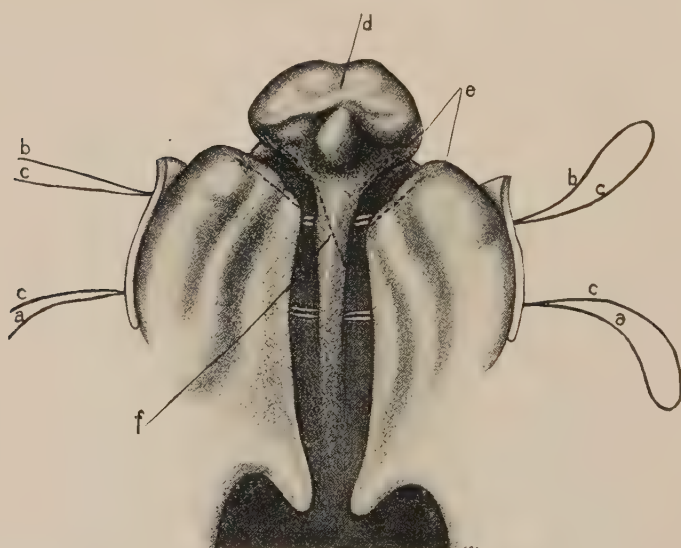


FIG. 254.—Method of treating tripartite cleft palate. The wires have been introduced as in Form 7, and the lead plates are adjusted. The dotted lines indicate the incisions. It will be noticed that the vomer is cut obliquely (f) so as to allow it to be moved backward into proper position. The wires, etc., are lettered in order that they may be identified in the subsequent figures (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

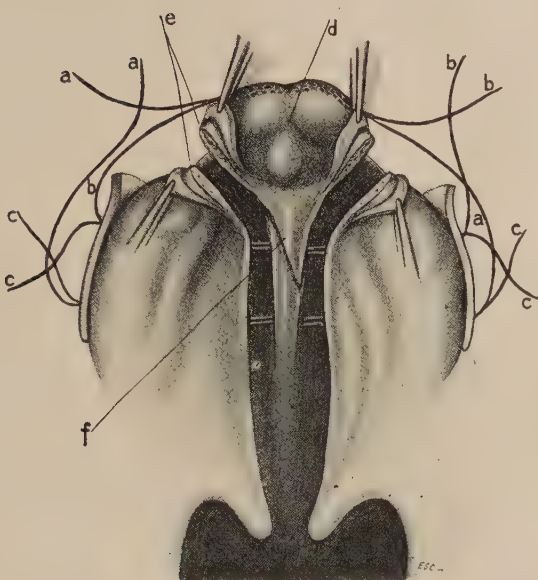


FIG. 255.—The second step in the procedure, showing the flaps made in the muco-periosteum and the compact bone removed from the surfaces to be placed in contact. It will be noticed that wire sutures have been carried through the maxillae and the vomer. Wires are carried beneath the soft parts anterior to the premaxillae indicated by the dotted lines. These sutures will enable the surgeon to bring the bones into close proximity (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

FIG. 256.—The premaxillae have been placed in their normal position and the flaps sutured with horse-hair. The mucous membrane over the vomer and edges of the hard palate has been split and the underlying bone freshened so that union takes place without placing any sutures in the median line. The soft palate is united later (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

Technic of the Brophy Operation for Form 8.—The operation for form 8 (Fig. 239) is practically the same as for form 7, except that it is necessary to bring the premaxillary bones posteriorly and keep them wired until union has taken place. It will be noticed that the vomer in this type of cleft palate is the chief factor in

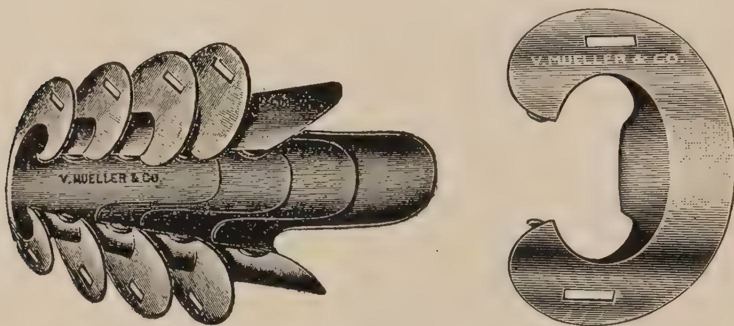


FIG. 257.—Combination of gag and speculum (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

preventing the premaxillary bones from occupying their normal position (Fig. 252). If an incision is made as illustrated in Fig. 253 a submucous portion of the bone can be removed with a pair of small-bladed bone forceps. This will at once allow the premaxil-

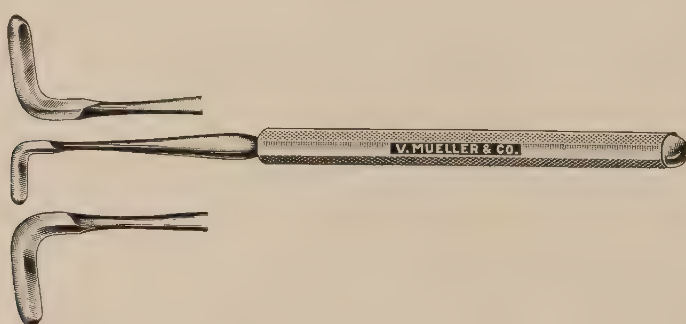


FIG. 258.—Brophy's periosteotomes (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

lary bones to go into position. The wires are already in place, (Fig. 254) and the two maxillary bones are brought closer together by twisting the wires *c-c*. The other wires, marked *a-a* and *b-b* are then brought around *in front* of the premaxillary bones,

not through them. Before completing the twisting, flaps are raised as in Fig. 255, and are sutured as shown in Fig. 256. The ends of the wires that are brought to the front of the premaxillary bones are cut at an angle so that they are sharp enough to pierce the frenum, and thus allow the wires to rest at a sufficiently high level. At the end of six weeks the wires are to be removed.

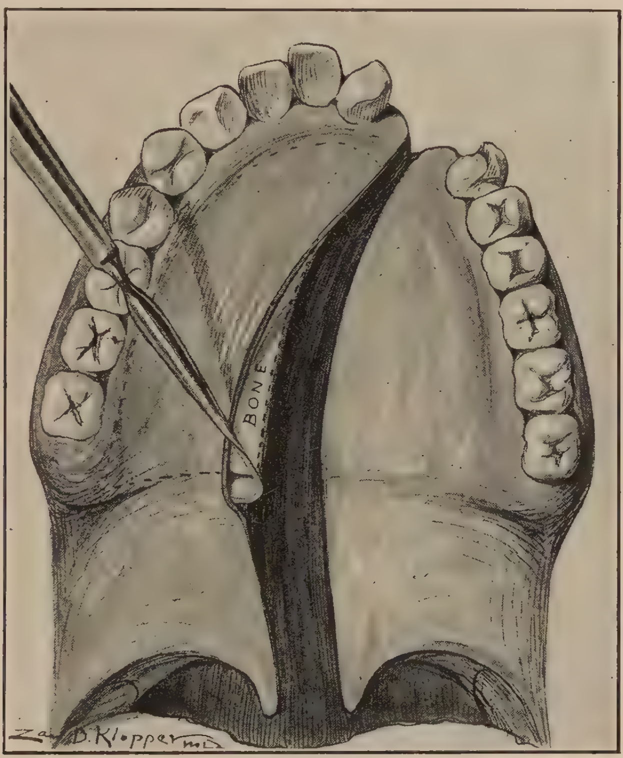


Fig. 259.—Denuding the bone of muco-periosteum. The membranes are lifted as shown by the dotted line (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

Nothing is done for the soft palate until the infant reaches the age of 16 months.

Technic of the Langenbeck Operation as Modified by Brophy for Forms 6, 7 and 8 When Patient is Sixteen Months of Age or Older, Including Adults at Any Age.—The tongue is first grasped with a small pair of forceps and a suitable Brophy speculum is inserted

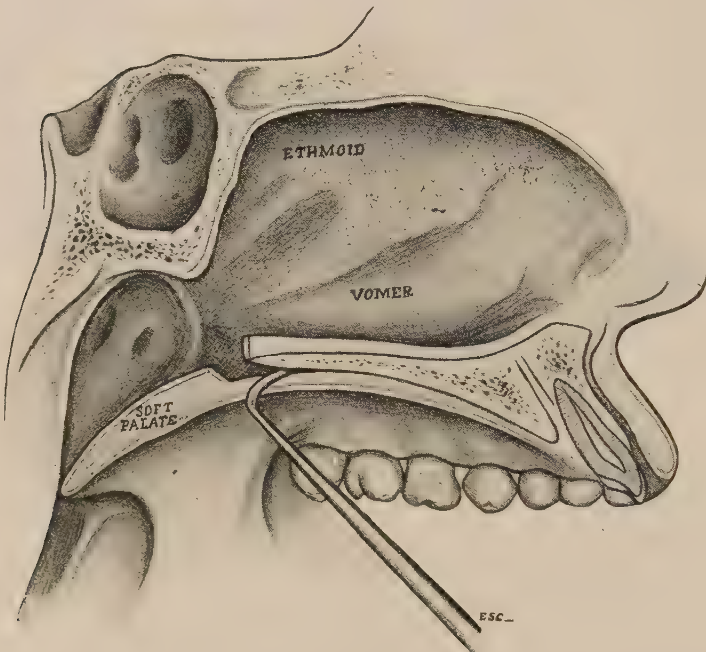


FIG. 260.—Method of dividing the aponeurosis or the nasal muco-periosteum from the posterior border of the horizontal plates (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

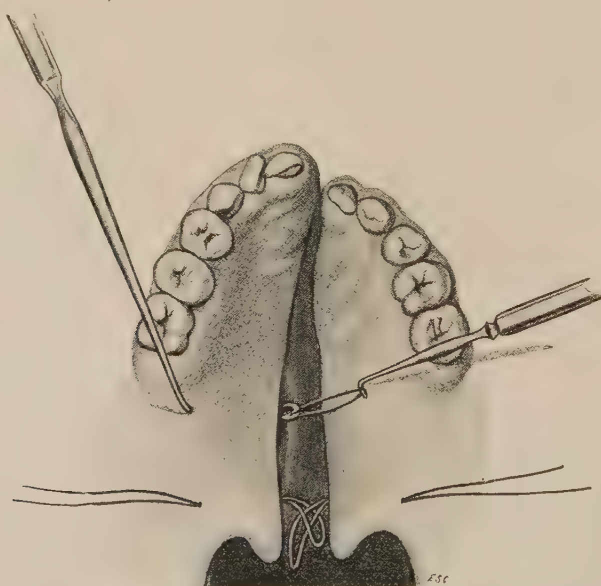


FIG. 261.—Method of introducing silk pilot sutures in soft palate operations. This precedes the introduction of the silver wires (Brophy, "Cleft Lip and Palate," Copyright P. Plakiston's Son & Co.).

(Fig. 257). This acts as a mouth gag and reflector of light as well as a tongue depressor. The next step consists of lifting the mucoperiosteum from the bone. The instruments used for this purpose are shown in Fig. 258. The mucoperiosteun is not tenaciously attached (Fig. 259) excepting at the posterior border of the hori-

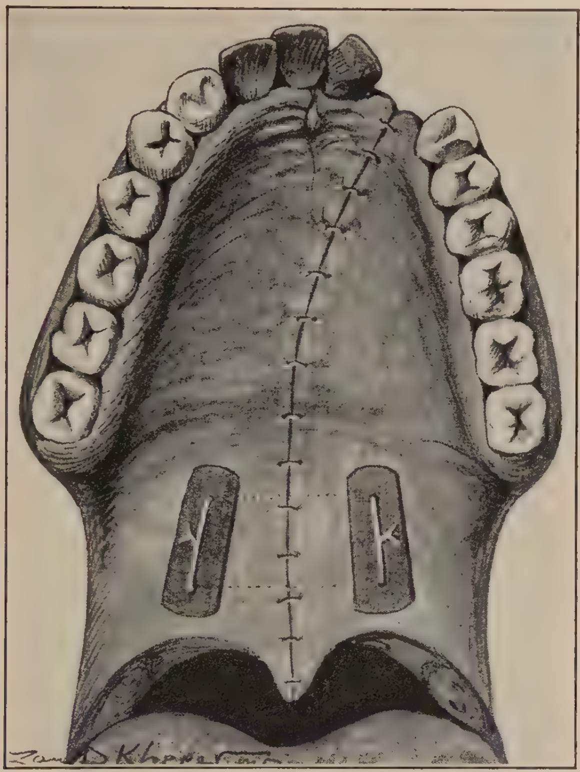


Fig. 262.—Two wire sutures with lead plates are nearly always sufficient. Coaptation horse-hair sutures show in the median line (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

zontal plates. The aponeurosis is best divided with a right angle knife (Fig. 260) or with curved scissors. Both sides are prepared in the same manner. The next step consists of piloting braided silk which in turn will carry silver wires (gage 20) through the soft palate (Fig. 261). The edges of the flaps are pared, the bifid uvulae are pared or split, and even the palatopharyngeal

muscles are pared. Some operators are satisfied to close a cleft palate without attempting to suture posterior to the uvula. This means that the soft palate will not be long enough to close off the opening between the nasal and oral cavities, *and consequently speech will always be defective.*

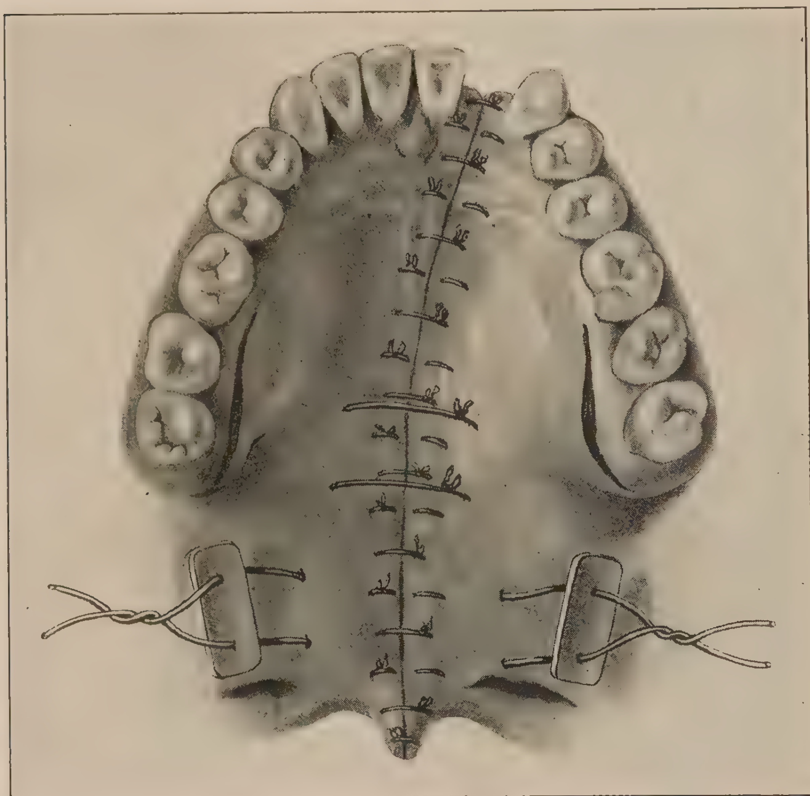


FIG. 263.—Shows relief incisions. Artist failed to show mattress sutures (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

The pared edges of the flap will meet in the center and are sutured as shown in Fig. 262. In rare instances the flaps will need relief incisions, as shown in Fig. 263. Note that the incisions are sufficiently high to escape the palatine vessels. After the two flaps are sutured with horsehair, the silver wires are then adjusted to the lead plates (gage 20) so as to relieve all tension, the wires are

cut so that they will have about 4 turns on them and the ends are embedded in the plates.

When silver wires and lead plates are not used, the operator must resort to the making of lateral incisions in the soft palate. These incisions are made just back of the tuberosity, and are subsequently packed with iodoform gauze.

There are two principal objections to lateral incisions of the soft palate (these do not apply to the hard palate); first, healing is not as successful as when the Brophy technic is used; second, the resulting scars make the soft palate unyielding and speech is, as a consequence, defective.

Horsehair is probably the best suturing material, as it does not absorb the oral secretions. Stitches and wires are removed in a week or ten days. In some cases, particularly in young patients, a general anesthetic is required for the removal of the stitches.

The patient is placed on a sterile liquid diet, and a few drops of a mild antiseptic are placed on the stitches and in both nostrils about three times a day. A pipette is best adapted for dropping solutions into the nose or on the palate. Talking is forbidden and crying should be prevented if at all possible. If necessary, paregoric or even morphine should be used to control immoderate crying.

Should primary hemorrhage be very profuse, it is as a rule readily controlled with sponges that have been wrung *free* of water at 160°F. A solution of epinephrin (1 in 10,000) may be used on a sponge, the latter being held in place under pressure. Should primary or secondary hemorrhage be serious, it will be necessary to pack the nasopharynx as shown in Fig. 264. Figure 265 shows two rubber catheters that have been inserted through the nostrils. A large gauze pack with tape strings sewn to it is then tied to the catheters. As the catheters are removed the pack is brought forward and is wedged between the palate and nasopharynx. The strings are tied under the columella. (See Fig. 264.) At the end

of three days the pack may be removed. In the hundreds of cases coming under my care, I have had to resort to packing but in three instances.

Lane's Operation for Cleft Palate.—Lane's operation for cleft palate is diagrammatically shown in Figs. 266 and 267. The

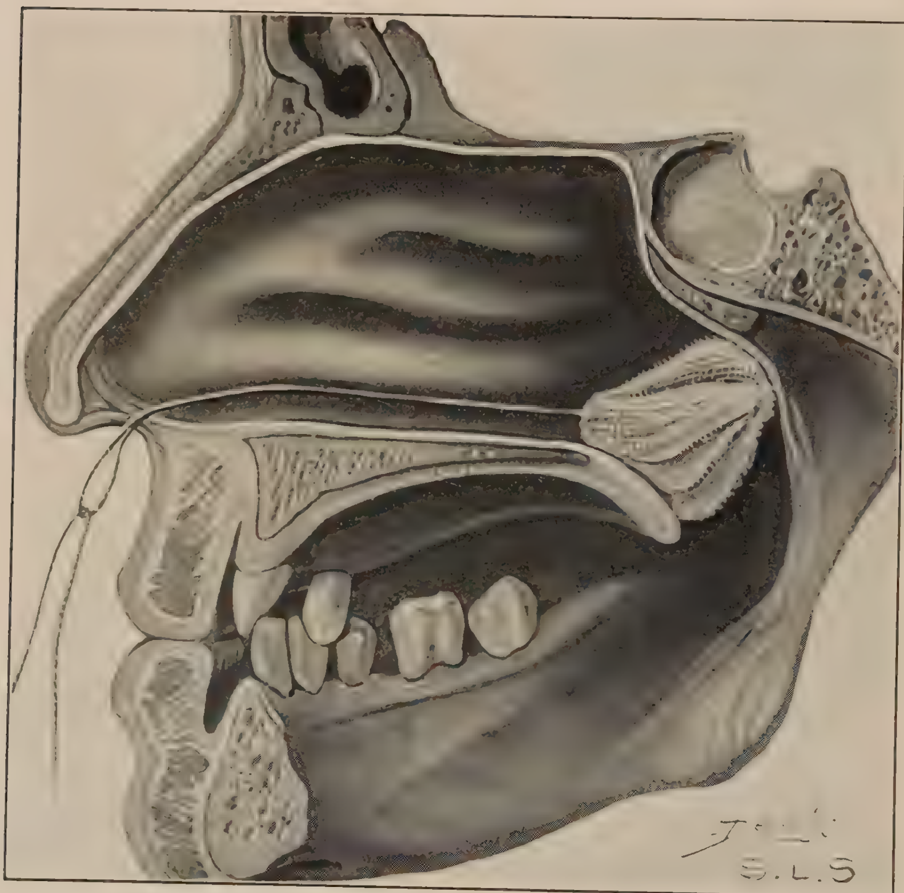


FIG. 264.—Gauze wedged between palate and naso-pharanx for control of hemorrhage. See Fig. 277 showing as tuffed rubber finger cot protecting the columella from abrasion by the silk ligature.

flap on the reader's right is turned over like a leaf of a book and is insinuated under the raised mucoperiosteum on the left side.

The objections to this operation are, first, the cleft is not narrowed, second, should sloughing occur, the damage would be

irreparable. In the Brophy and Langenbeck procedures these objections are not encountered.

Secondary Operations on the Palate.—Not infrequently, partial failure will follow a careful operation and correct after-treatment. Particularly is this true of the Langenbeck operation just described.

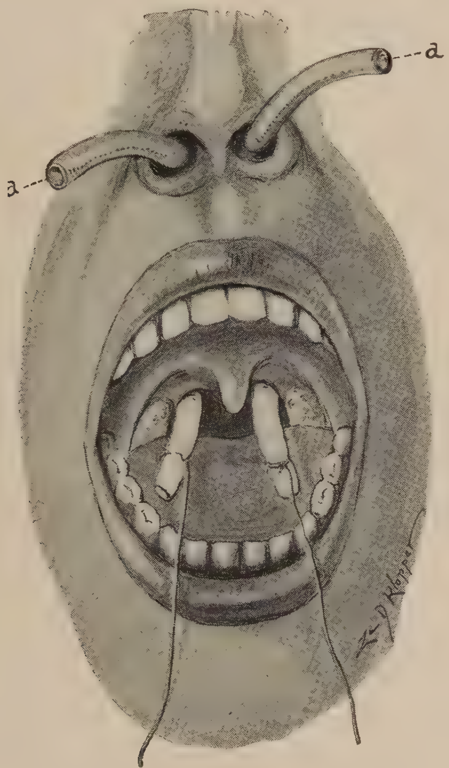


FIG. 265.—*A*—*A* are the catheters carrying silk sutures into position (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

The Brophy operation on the bones is nearly always successful, at least I have never seen a case of failure, but should failure result, the secondary operation will not differ from the first. Complete failure, that is where the flaps failed to unite throughout the whole length in a cleft, such as shown in Fig. 262 is very rare. The usual extent of failure is shown in Fig. 268*A*. Figure 268*B* shows correction of same.

Secondary operations should not be attempted in less than 2 months after the first operation. Secondary operations are nearly

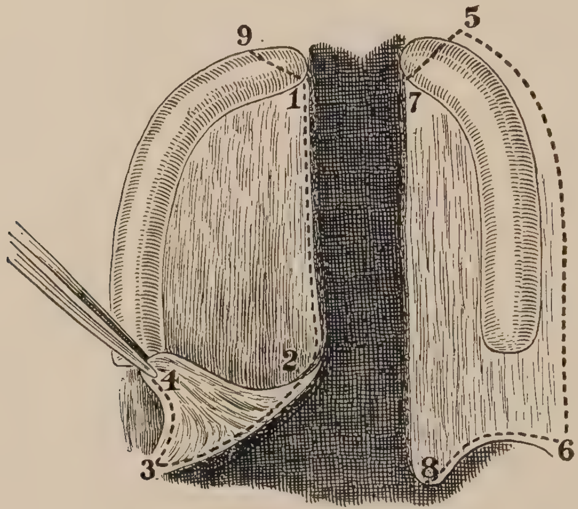


FIG. 266.—Lane's operation for cleft palate (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

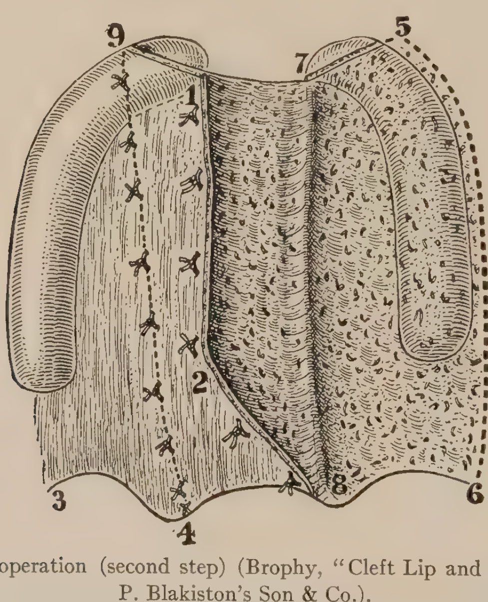


FIG. 267.—Lane's operation (second step) (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

always successful, due, no doubt, to the fact that the flaps become thicker and also because the tension is being controlled by the por-

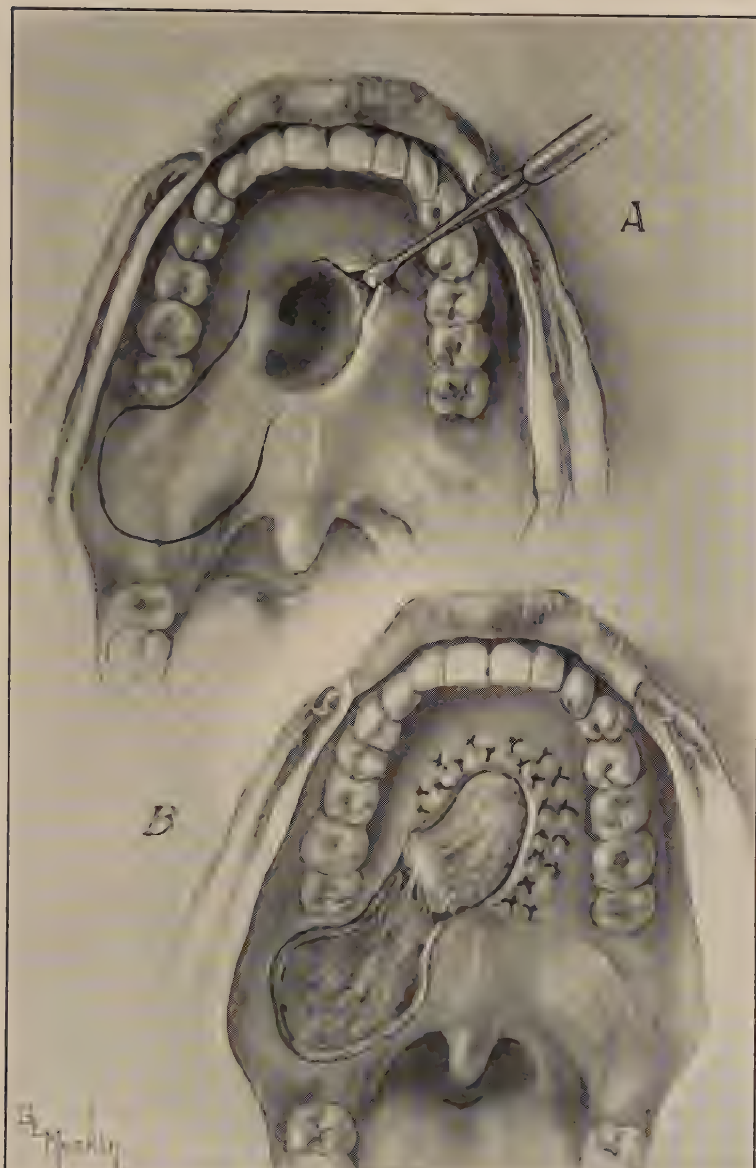


FIG. 268A—B.—Shows technic for closure of hole in palate (Brophy, "Cleft, Lip and Palate," Copyright P. Blakiston's Son & Co.).

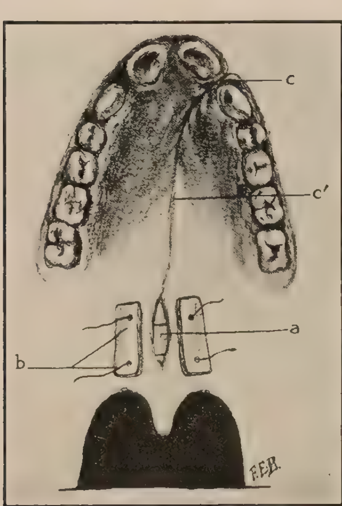


FIG. 269.—Shows method of closing hole in soft palate (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

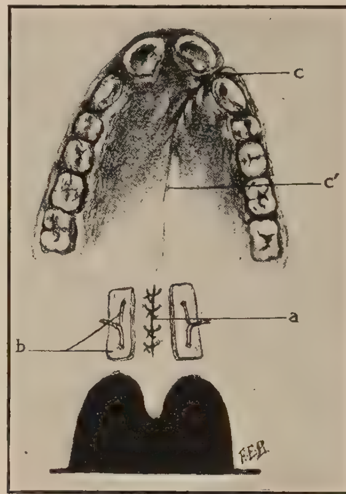


FIG. 270.—Completed operation (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

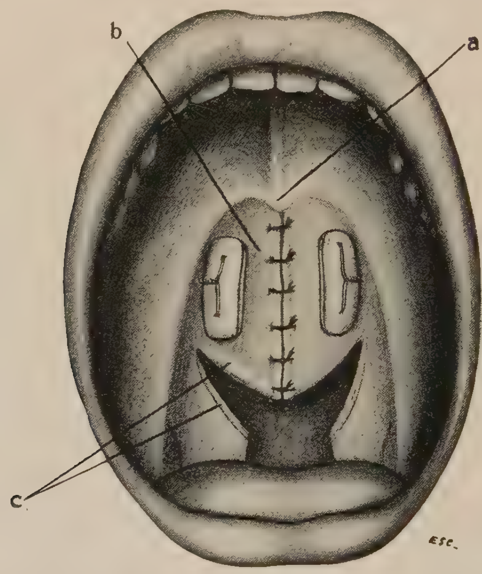


FIG. 271.—This illustrates method of lengthening the soft palate by utilizing the palatopharyngeal muscles (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

tion of the palate that healed after the first operation. Figures 269 and 270 show technic of closing the opening in the soft palate, while Fig. 271 shows the method of lengthening the soft palate by

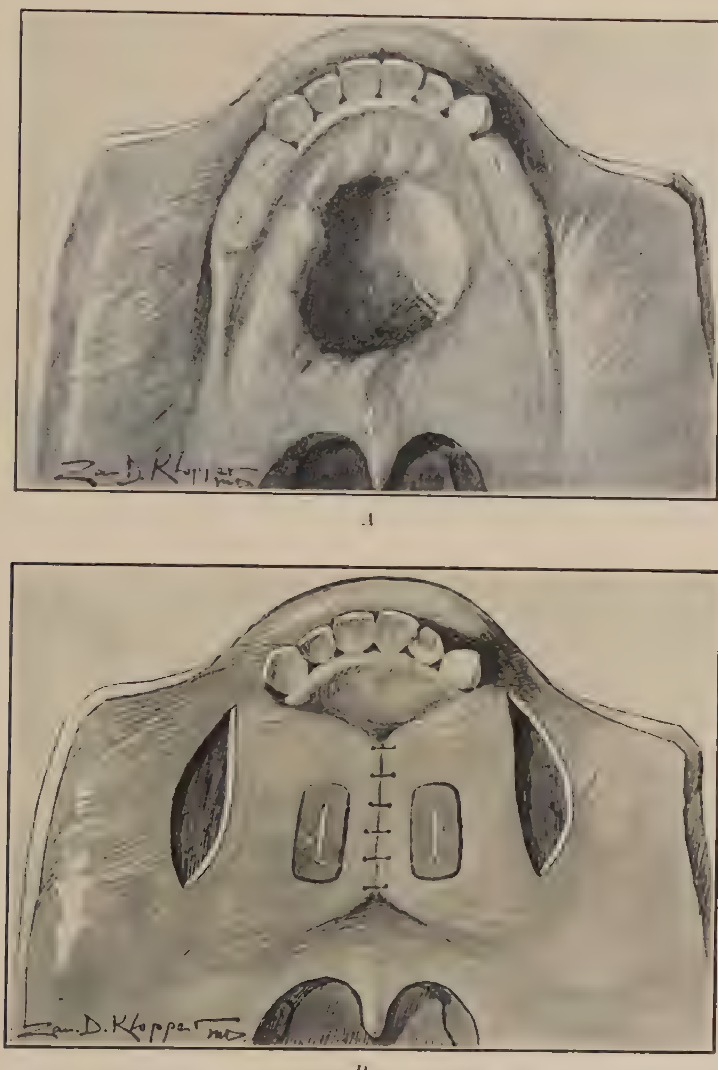


Fig. 272A—B.—Shows before and after operation for closure of large hole in hard palate (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

utilizing the pared palatopharyngeal muscles. There are several methods employed in closing an opening in the hard palate. For

large openings the teeth, whether deciduous or permanent, are extracted and the gums allowed to heal. Incisions are then made in the buccal fornices Fig. 272*A* and *B* and the flaps dissected from the bone. Suturing is done with horsehair supplemented by the silver wires and lead plates. Smaller openings may be closed on

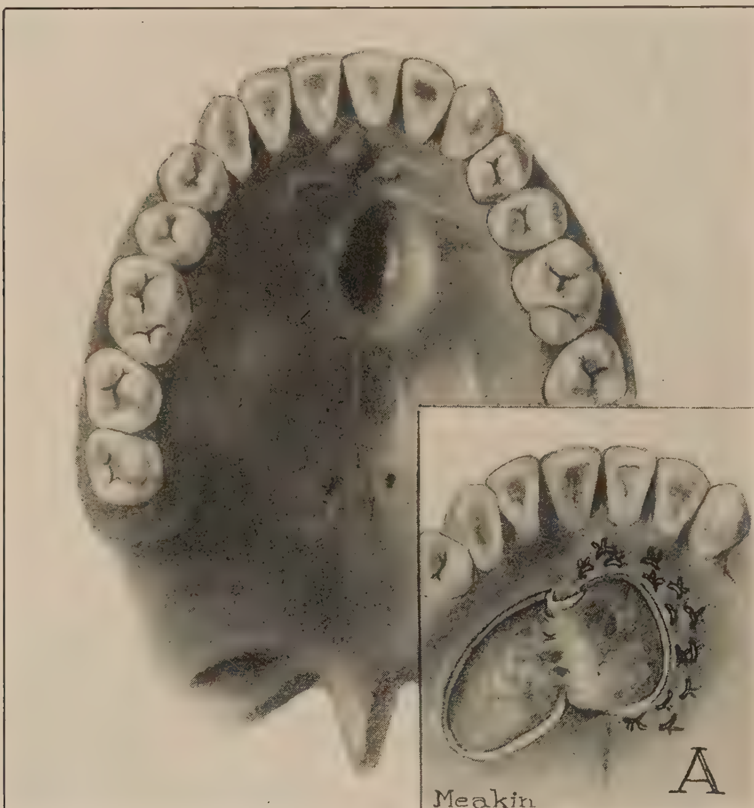


FIG. 273.—Closure of hard palate defect on the Lane principle (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

the Lane principle (Fig. 273). It will be noticed that only a single flap is used on the right side while the tissues on the left are merely lifted sufficiently to allow the flap from the right side to be tucked under. The raw surfaces are thus brought in contact and sutured with horsehair. Figure 273*A* shows that the bone of

the palate is bared, but this is of no consequence as within ten days granulations will entirely cover it, and the final appearance of the palate is very good.

Correct Technic for Twisting Wires.—In order to prevent wires from breaking, the twisting should be stopped when the twisted portion of the wires is seen to touch the lead plate. Then, the wires are pulled upon with considerable traction. This stretching is to be followed by again twisting the wires, until they again come in contact with the lead plates. *If the wires are thus alternately stretched and twisted, breaking will not occur.*

ATRESIA PALATI

Definition.—Adhesion of the soft palate to the posterior pharyngeal wall.

Atresia of the palate is a comparatively rare condition and may follow an operation for adenoids or the removal of tonsils. The patient is very much distressed owing to inability to breathe through the nose (Fig. 274). The distress is particularly noticable during the taking of food. Atresia of the palate may also follow any disease that leaves an excoriated surface. Diphtheria, syphilis and scarlet fever may be followed by adhesion of the palate to the pharyngeal wall.

Treatment.—The treatment for atresia palati is, of course, surgical and is best performed under local anesthesia. Figure 275 shows a large silver probe acting as a guide; a right angle knife separates the adhering palate from the posterior pharyngeal wall. To merely pack the tissues apart for a few hours will invariably result in reunion, as tissues that have once been adherent have an inexplicable affinity for each other. It is, therefore, necessary to resort to a suitable appliance that will remain in place for about eighteen days, thus allowing granulations to smooth over the freshened parts.

After the palate has been separated from the pharyngeal wall, two catheters are inserted in the nostrils as already described under nasal tamponing (Fig. 265) and instead of using a sponge, a piece of unvulcanized rubber about 5 cm. wide and 8cm. long is put in place. The four corners of the piece of rubber are perforated so that they may be tied as shown in Figs. 276 and 277. At the

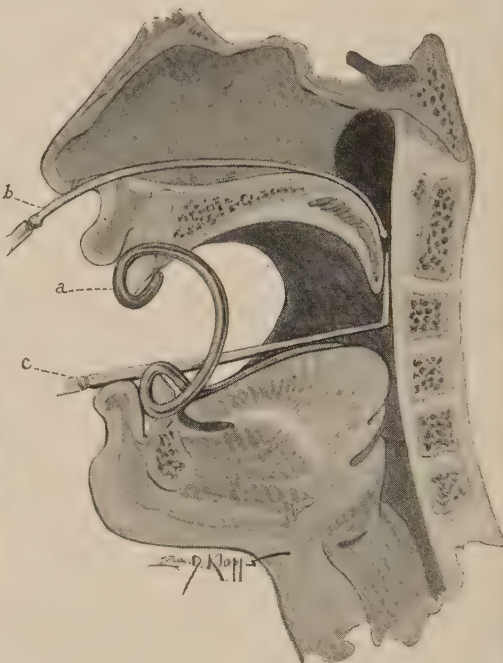


FIG. 274. FIG. 275.

FIG. 274.—A longitudinal section of the mouth and pharynx. *A* shows adhesions of the palate to the posterior wall of the pharynx. It will be seen that the passage between the nasal cavity and the pharynx is completely occluded. *B* represents the pocket between the palate and posterior wall of the pharynx in which secretions accumulate and cannot escape except through the anterior nares (Brophy, ' Cleft Lip and Palate,'' Copyright P. Blakiston's Son & Co.).

FIG. 275.—*A*, the wire oral speculum in position; *B*, the heavy silver probe, bent and introduced into the nostril, carried back to the posterior wall of the pharynx, serving as a guide in separating the palate from its adhesions; *C*, the knife employed to separate the palate from the posterior pharyngeal wall (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

end of eighteen days the strings are cut and the rubber removed. As Dr. Brophy points out, this operation should not be performed on any patient whose blood is not Wassermann negative.

FIG. 276. FIG. 277.

FIG. 276.—Sutures carrying rubber plate into position between the freshened surfaces (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

FIG. 277.—*A*—*A* are sutures firmly holding rubber plate in position between the freshened surfaces. *B* is a rubber glove finger stuffed with cotton, placed over the columella of the nose to protect it from abrasion by the silk sutures which hold the upper portion of the rubber plate firmly in place (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

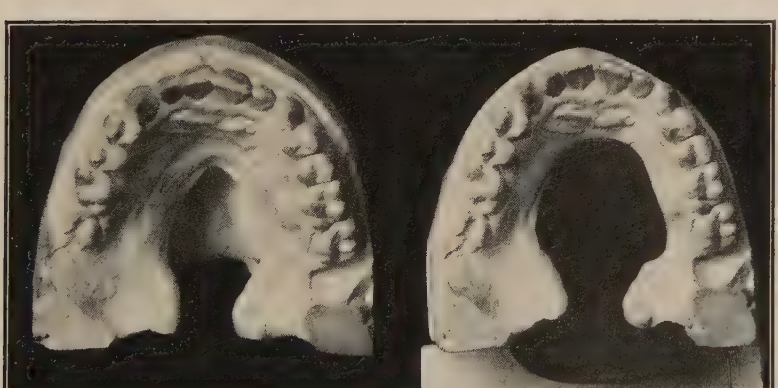


FIG. 278.—Case's palate obturator (Brophy, "Oral Surgery," Copyright P. Blakiston's Son & Co.).

PALATE OBTURATORS

It is apparent from what has been said that no one would prefer an artificial palate to one surgically made. The indications for prosthesis in palate deformities are indeed few. They are, however, particularly indicated in syphilitic patients, and in adults who have lost considerable tissue, due to atrophy. Figure 278 shows Case's palate obturator. The palate obturators attached to teeth have not been satisfactory and have been largaly discarded.

CHAPTER XXVII

THE TRAINING OF SPEECH AFTER CLEFT PALATE OPERATIONS

By G. Hudson-Makuen

Importance of Palate.—There is a popular notion that the tongue is the chief organ of speech and that the sense of taste is located in the palate. When a person is talkative, he is said to have a "long tongue;" when he is caustic in his remarks, a "sharp tongue;" and the Biblical reference to the "unruly member" is well understood. Moreover, it is not an uncommon thing to hear it said that certain articles of food and drink "tickle the palate." Physiologically it would be more accurate to refer to the palate as being the "unruly member" and to regard the tongue as the organ in which is located the sense of taste.

Both the palate and the tongue are important organs of speech, but the former is the more so, for not only is it essential in the enunciation of nearly all the elements of speech, but, owing to its direct attachment to the larynx, it is also an important factor in the production of voice. The vowel sounds may be articulated when the palate is defective, but their resonance is so much impaired that they are scarcely recognizable and their pitch cannot be changed with any degree of accuracy. It is in the articulation of consonant sounds, however, that the palate is especially essential.

The Consonants.—Of the twenty-three consonant sounds, only two, the "m" and the "n" can be given intelligibly when the palate is not intact, and even in these the resonance is somewhat impaired. All those consonant sounds in the enunciation of which

the tongue is a conspicuous factor, the th, hard and soft, s, z, sh, zh, t, d, n, l, r, k, g, ng, h, y, as well as those in which the lips and teeth are used, the p, b, m, wh, w, f, and v, are impossible to a person with a defective palate. This is true because, in the enunciation of these sounds, the palate is necessary to confine the breath to the oral channel and to prevent it from passing up through the nasal chambers.

How Made.—It will be borne in mind that the consonant sounds are made by impeding the moving column of breath at certain points above the larynx. The points at which the impediment takes place have been called the stop positions. These have been divided into the anterior, the middle and the posterior stop positions. The anterior one is formed by the lips (in the articulation of the so-called labial sounds, p, b, m, wh, w), by the lower lip and the teeth (in the articulation of the labio-dentals, f, v), and by the tip of the tongue and the teeth (in the articulation of the linguo-dentals, th′, th″); the middle one by the tongue and the hard palate (in the articulation of the anterior linguo-palatals,

PHYSIOLOGICAL TABLE OF SOUNDS

Vowel Sounds

E.	A.	Ah.	Aw.	O.	OO.

Consonant Sounds

	Voiceless oral	Voiced oral	Voiced nasal
Labials	P.	B.	M.
	Wh.	W.	
Labiodentals	F.	V.	
Linguodentals	Th′	Th″	
Anterior Linguopalatals	S.	Z.	
	Sh.	Zh.	
	T.	D.	N.
		L.	
		R.	
Posterior Linguopalatals	K.	G.	Ng.
	H.	Y.	

s, z, sh, zh, t, d, n, l, r); and the posterior one by the dorsum of the tongue and soft palate (in the articulation of the posterior linguo-palatals, k, g, ng, h, y). For all these sounds requiring an impediment in the outgoing column of breath, whichever stop position may be used, it is necessary to have a freely movable and normal palate.

Function of the Palate.—The function of the palate in the articulation of consonant sounds, therefore, is two-fold. In all those sounds in which it does not assist in the formation of the stop position, it serves as an obturator between the nose and the pharynx, completing the partition between these two cavities and compelling the outgoing breath to pass through the particular stop position required for the sound. For instance, in the articulation of labials, labio-dentals and linguo-dentals, the sounding breath must pass through the anterior stop position, and the palate serves to diverge it in this direction and to prevent it from passing through the nostrils. In a similar manner, when the hard palate is intact and the middle stop position is used, as in the articulation of the linguo-palatals, the sounding breath must pass through this constricted aperture, and the function of the palate is to prevent it from passing upward through the nostrils. In the use of the posterior stop position, which is formed by the junction of the velum palati and the dorsum of the tongue, the soft palate serves a double purpose. Its free border rises against the posterior pharyngeal wall, closing the avenue to the nostrils, and its anterior surface, acting in conjunction with the tongue, forms the stop position for the sound. In the enunciation of these posterior linguo-palatal sounds, a perforation of the hard palate would have little if any, effect upon the articulation, but it would somewhat modify the vocal resonance.

Interference of Speech Due to Palate.—It will be observed that the tongue and the palate act together in the processes of articulation and that the palate also serves to prevent the sounding

breath from passing through the nostrils and to focus it upon the particular stop position that is being used. The various defects of the palate that interfere with speech are.

1st. Paralysis of the muscles.

2nd. Perforations.

3rd. A lack of union between the lateral halves, commonly known as a "cleft palate."

The paralysis of the muscles of the palate may follow diphtheria or some other infectious disease, or it may be the result of external violence and, inasmuch as it interferes with the valvular action of the palate and allows the breath to pass up through the nose, its effect upon speech is somewhat similar to that of a cleft palate.

A perforation of the palate effects speech more or less, according to its size and location. If it is in the hard palate, anterior to the stop position which is being used, its effect may be scarcely noticeable, but if it be posterior to the stop position, whether in the hard or the soft palate, its effect is very marked, and if the perforation is a large one, its effect is similar to a cleft in the palate or a paralysis of the levator palati muscles.

Characteristic Speech of Cleft Palate.—The characteristic speech of one having a cleft palate is familiar to all, but its physiology may not be so well understood. The impaired resonance of the voice, caused by a cleft in the palate, is more marked than we should expect, and it illustrates how important is every part of these mechanisms to the normal voice. In addition to this impaired resonance, the cleft palate interferes with the inflections of the voice and thus destroys its natural melody. Moreover, the mechanism or physiology of speech is entirely changed. The formation and practical use of the three stop positions above mentioned are impossible in cases in which the palate is cleft. The anterior and middle stop positions may be formed by means of the lips, the teeth, the tongue and the hard palate (unless this be cleft throughout its entire length), but they never are formed

because it is impossible for the patient to focus the vocalized breath at these points when there is a free channel for it to pass up through the cleft and out through the nostrils. The posterior stop position cannot be formed because, as I have explained above, its formation depends upon a freely movable and normal palate.

The purely vocal sounds, therefore, are the only ones that can be even approximated when the palate is cleft and they, as I have shown, are defective in respect to resonance and melody. The consonant sounds are generally almost entirely unintelligible and they are made with a totally different mechanism. For the three normal stop positions, the patient endeavors to substitute others further back in the pharynx. For some sounds the base of the tongue and the posterior wall of the pharynx approximate to form the stop position, and for others the lips of the larynx formed by the arytenoid cartilages, the arytenoid and aryepiglottic folds are used. With such substitutes for the normal stop positions, situated as they are far back in the throat, it is not surprising that the articulation and phonation should be so defective and indistinct.

Explanation of Defective Speech.—It will be observed that the three defects of the palate, which I have mentioned, have a similar effect upon the character of speech. There is this difference, however. Paralysis of the muscles of the palate and perforations are usually acquired defects and generally appear after the development of the faculty of speech, while the cleft palate is congenital and comes before the development of the faculty of speech. In the former two conditions, normal speech has merely been interrupted, while in the case of a neglected cleft palate, no normal speech has been developed. This explains in part why the speech of a person with a cleft palate is more defective and less intelligible than the speech of those having paralysis of the muscles or perforations. The indications for treatment in the latter two conditions are, in the one, to restore the normal action of the muscles

involved, and in the other, to close the perforation either by means of natural tissue or some mechanical appliance. When this is accomplished, the speech generally approximates the normal condition or that condition which obtained before the defect appeared.

Speech Habits.—In the case of the cleft palate, however, where only abnormal speech preceded the defect, we have a very different condition of affairs. It will be remembered that the acquirement of speech habits begins early in the second year and continues during the period of childhood. It is during this time that Nature provides for the normal development of speech. Children appear to inherit a tendency toward speech development and cases have been reported in which whole sentences have been uttered spontaneously without any preliminary practice. The more serious forms of defects of speech are those that are acquired during this formative period. It is then that faulty impressions of the elements of speech are stored in the auditory centers of the brain and faulty habits formed to the use of the various mechanisms of speech.

When to Correct Defects.—Other things being equal, therefore, all anatomical or structural irregularities having a tendency to impede the normal development of speech during this period should have our most careful attention, and *measures for the correction of these conditions should be adopted as early as possible, before the cerebral impressions and peripheral habits are established.* Inasmuch as surgical measures for the closure of the cleft palate are undertaken largely for the purpose of improving speech, *they should be employed as early as possible before the formative speech period.* Surgical measures, as a rule, however, give the patient only a little better chance for the development of good speech. Even if we were able to furnish the patient with a perfectly normal palate, it is a well-known fact that the character of the speech would remain almost unchanged, because, as I have explained above, the patient has never learned to use the natural mechanisms

of speech, but he has been forced to substitute mechanisms that are inadequate to the requirements.

No habits are more difficult to change than habits of speech. The fact is they cannot be changed without special aid and instruction. This is true, mainly, because the ear of the speaker, having grown accustomed to faulty articulation, does not discriminate between it and the normal articulation and considerable practice is required to train the ear to make this discrimination and appreciate good speech while the organs are being trained to produce it.

To make a normal palate take the place of a cleft palate, the soft parts should be so manipulated as to avoid the formation of scar tissue. If this is done, a palate soft and flexible may be produced. If incisions are made through the soft parts and measures omitted to lengthen the palate, masses of cicatricial tissue will form with contractions.

The two reasons for attempting to close a cleft palate are, first, to improve the physical condition of the patient by giving to him a more nearly normal respiratory tract, and, second, in older patients, to improve both his physical and mental condition by giving to him an approximately normal means for communication with his fellows through the channels of oral expression. The second reason for the operation is even more important than the first because the patient's curious and faulty speech affects him both mentally and physically.

Inadequacy of Merely Closing Cleft.—As I have said, the mere closure of a cleft palate in an adolescent or adult person, does not, as a rule, improve the speech to any appreciable extent. I am aware that there are those who hold an opposite opinion, but in the cases that have been improved, I think some outside assistance has always been rendered. Even the little help that may be given by an intelligent parent is fraught with good results in many instances, but the degree of success that may be obtained is generally proportionate to the skill of the teacher and

the ability of the patient for persistent and concentrated effort. It has been said that a faulty habit of speech must be supplanted by a correct one, but it is more than a habit. It is deeply rooted neuromuscular disturbance or perversion that has arisen from an effort on the part of Nature to accommodate itself to developmental structural irregularities in certain important parts of these mechanisms. It is somewhat analogous to the effort on the part of the neuromuscular mechanisms of the heart to accommodate themselves to a faulty valve, but it is far more complicated because of the volitional and other physical faculties employed in the development of speech.

Movements of the Soft Palate.—As I have shown, the palate is one of the most important organs of voice and speech. Its integrity is essential to the tones of the voice as well as to the moulding of voice into speech by the processes of so-called articulation. The soft palate has a wide range of movement. Its function in vocalization is to assist in controlling the action of the vocal cords and regulating the size and shape of certain important resonance chambers, and its function in articulation is to shut off the nasal from the oral cavity during the emission of the explosive and fricative sounds, and to form contacts with the tongue in the formation of the so-called posterior linguo-palatal sounds. This will be better understood if we glance for a moment at the accompanying charts.

The table (page 308) contains the physiological alphabet of vowel and consonant sounds. It will be observed that the consonants are arranged in groups and named according to the particular organs of articulation employed in their formation.

In Fig. 279 we have a series of drawings of the palate, alveolar arch and teeth, and the shaded portions represent the points of contact of the tongue during the emission of the sounds represented by the letters or symbols accompanying them. I may say that these drawings, taken in part from Kingsley's palatograms, are

fairly accurate and the last one is a diagrammatic picture of a complete cleft of the palate.

If we compare the normal palate with the cleft palate and glance at the points of tongue contacts in the drawings, we shall

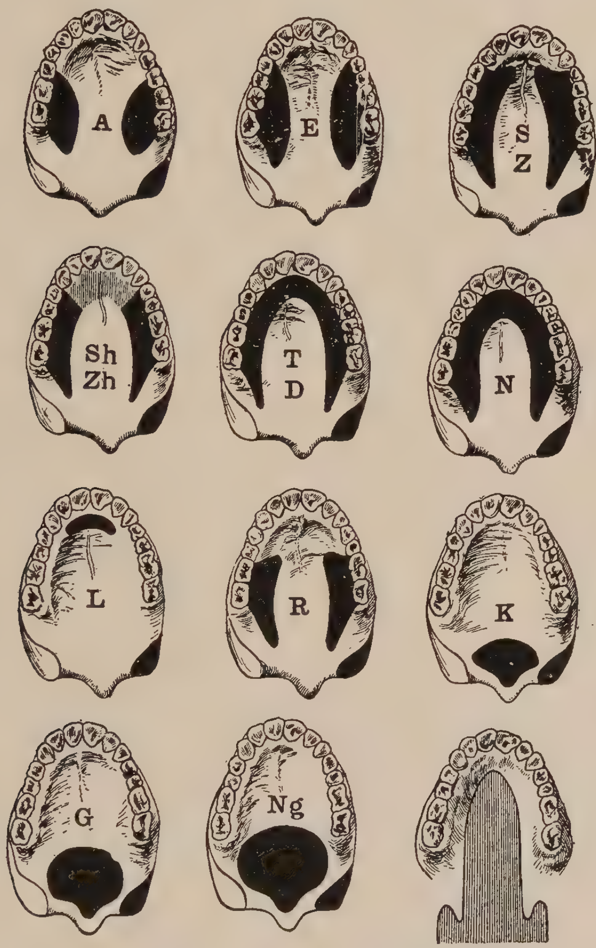


FIG. 279.—The shaded portions representing the points of contact of the tongue during the emission of the sounds indicated by the accompanying letters (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

readily see exactly what consonant sounds must be faulty when the palate is cleft and these, of course, are the sounds which we hope to improve by our operation. In addition to these, however,

there are other sounds that are defective when the palate is cleft, and they are the explosives and fricatives, which require a complete

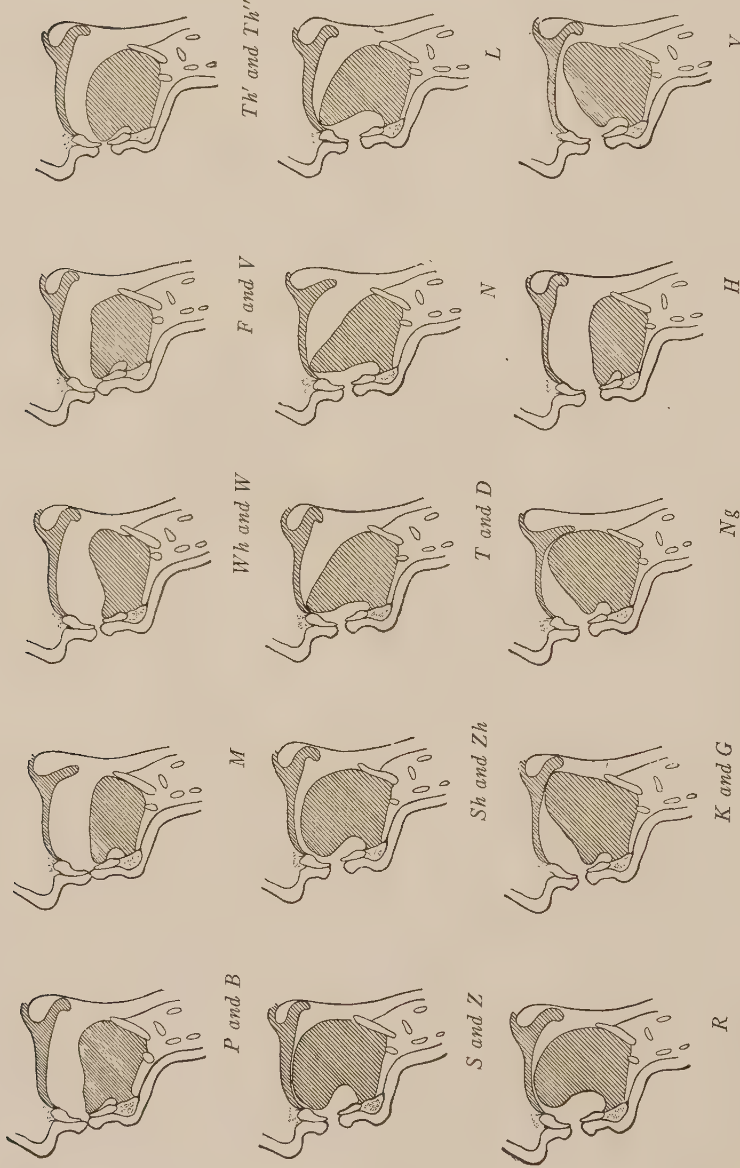


FIG. 280.—Physiological alphabet. Showing the positions of the soft palate and tongue in the articulation of the sounds indicated by the accompanying letters (Brophy, "Cleft Lip and Palate," Copyright P. Blakiston's Son & Co.).

shutting off of the nasal from the oral cavity. This is well shown by the drawings of some vertical sections of the organs of articula-

tion in Fig. 280 which drawings, of course, are merely diagrammatic. I would call attention especially to the position of the soft palate shutting off the naso-pharynx during the emission of the explosives and fricatives. By a comparison of the physiological alphabet with these drawings, it will be seen that when the palate, is cleft, all the consonant sounds, with two exceptions, will be defective necessarily and, when the cleft extends through the alveolar arch and lip, all will be defective with no exception whatever.

Organ Perversions.—In the absence of the normal palate after the first year, therefore, the patient tries to substitute, for purposes of speech, certain other organs lower down in the throat, such as the epiglottis, the aryepiglottic folds and the ventricular bands, and in this process of substitution, faulty musculatures are developed, including a faulty development of the nerve centers supplying them. This gives rise to the neuromuscular perversion to which reference has been made and which, as I have said, is really more than a habit.

It must be remembered that we are dealing here with a psychical as well as a physical perversion with a faulty development of the central as well as the peripheral mechanisms of speech, including the receptive, the executive and even the intellectual centers.

The correction of these conditions is by no means a simple procedure. The patient himself cannot accomplish it, because his central mechanisms are involved, and he cannot make a diagnosis of his own case. So accustomed has he grown to his speech that his ear has come to approve it and he cannot discriminate between his faulty forms of speech and the correct ones. He has no ear for correct speech, just as some people have no ear for musical tones and have to learn them by a long and plodding process. Moreover, every day of faulty speech tends to increase these unfortunate psychophysical conditions and to lead the patient farther and farther away from normal speech. The fewer the days of faulty speech, therefore, the better it is for the patient, and

hence the importance of doing the operation, if possible, even before the developmental speech period, or within the first year.

Training Needed.—In the adolescent or adult cleft palate patient, training will do more for the improvement of speech than will the operation. In other words, a patient who can have the advantage of but one of the two procedures can probably be given better speech by training alone than by an operation alone. The reason for this is apparent when we consider the limitations of the operation. In the first place, the speech, as I have shown, is defective in three important particulars, namely, in resonance, in melody and in articulation. The extent to which we can improve the resonance and melody of the voice by the mere closure of the cleft is very slight because, however well the operation may be done, the patient will have but limited control of a more or less tense velum and he will be unable, therefore, to regulate the size of the opening between the oropharynx and the nasopharynx. It is upon the regulation of the size of this opening, which is constantly changing during speech production, that normal resonance largely depends. When the opening is large, as in the cleft palate case, the nasal resonance predominates, and when it is small, the nasal resonance is diminished. Moreover, the rapid changes in pitch, which result in the so-called melody of the voice, cannot be made with any degree of accuracy, because the function of the palato-pharyngeal muscles, which have their lower attachments in the superior cornua of the thyroid cartilage of the larynx, is, at least, partially destroyed by the cicatricial contractions which follow the operation and by the atrophy which has taken place from the disuse of these muscles before the operation was performed.

Tongue Contacts.—As to the other particular in which the speech of the cleft palate case is defective, namely, the so-called articulation, our operation is of greater service because, as we have seen, the hard palate and velum are both essential to the normal tongue contacts of certain of the consonant sounds and if the cleft

extends through the alveolar arch and lip, nearly all the tongue contacts in the articulation of consonants will be faulty. Not only are the tongue contacts important, but in the production of many of the consonants there is a damming up, so to speak, of the breath in the mouth and a slight explosive effort as the sound is emitted. When this takes place in the normal mouth, the velum rises and shuts off completely the oral from the nasal cavities, and this is one of the things which the velum of a cleft palate cannot do and which it must be made to do before we can get the best results from the standpoint of speech. The velum of the cleft palate, therefore, should be united in such a manner that it will be as large and as loose as possible with its muscles in their normal positions and relations, and then the patient should be given such exercises as will have a tendency to develop in these muscles their normal physiological functions.

Much depends, therefore, upon the way in which the operation is done, but when the muscles of an adolescent or adult patient with a cleft palate have been united in their normal positions and relations, our work has only begun, because these muscles have become atrophied from disuse; they have no so-called tonus and scarcely any power. In other words, they have lost their normal function and, if left to themselves, they would never regain it, and it is this masterful inactivity of the palatal muscles after the operation, that gives to the speech of the cleft palate case its characteristic quality, and it is the restoration of the function of these muscles, more than anything else, which removes this disagreeable quality.

Kind of Training Needed.—From what I have said we must conclude that the training of the speech, after a cleft palate operation, is an exceedingly important feature of the treatment, and that this training consists in an effort, not only to establish functional activity in important muscles of phonation and articulation but also, to do this under somewhat unfavorable conditions. For-

tunately, it is not absolutely essential, in the majority of cases, that the peripheral organs of speech be made structurally perfect in order to enable the patient to acquire fairly satisfactory speech. In other words, the integrity of the peripheral organs of speech is only a factor and, indeed, a comparatively slight factor, in the process of speech development, the chief thing being the integrity of the central mechanisms of speech, upon which is based what has been called the speech instinct. A child with the speech instinct and with a full development of the cerebral mechanisms of speech will be able to overcome many structural imperfections of the peripheral organs, but a gross defect of these peripheral organs, such as a cleft palate, when it exists for a considerable length of time, interferes with the normal development of the cerebral mechanisms and thus destroys, to some extent, the ability of the patient to overcome peripheral imperfections without some special assistance. Our training, therefore, must be such as to affect central as well as peripheral conditions, and it differs not at all in principle from the training that is required for other forms of defective speech. The purpose of the training is to correct faulty actions of certain muscles and to develop normal action in certain other unused muscles.

Exercises.—A good, all-around exercise for the development of the palatal and pharyngeal muscles is a systematic and vigorous gargling three or four times a day with a warm, sterile solution. Another excellent exercise is to have the patient acquire by practice a voluntary control over the muscles of the palate and pharynx. This is done by an effort to elevate and depress the palate at will, under direct vision in a good light and with a mirror. The exercises should be practised regularly and for a long time under the direction of a teacher. Much may be accomplished also by the mechanical stretching of the palate, and for this purpose a sterile finger or some special instrument may be used by the physician. In addition to these general measures for the development of the

mechanisms of speech, a thorough course of training is indicated in both phonation and articulation. Correct breathing is of great importance in this work and exercises should be given to improve the voice, which is especially defective in rhythm and melody.

The training in articulation should be such as to meet the requirements of each individual case. Generally speaking, however, the patient should be taught all the sounds of the Physiological Alphabet and he should be taught to give them as nearly accurately as possible. His ear must be trained to recognize the correct sounds of speech and to distinguish between them and the faulty sounds. All this requires close attention on the part of the patient and long-continued practice under the direction of a skilled teacher. The teacher, to be successful in this work, must understand not only the anatomy and physiology of the organs of speech, but also the effect upon these organs of scientific training.

As early as 1887 the late Dr. G. V. Black stated: "There is a peculiar fact in connection with the phenomena of cleft palate. We may cut away the lips, the teeth and the tongue and the patient may talk plainly after all, but if we cut away the soft palate, it seems to be utterly impossible for the patient to speak perfectly. Rigid training is the most important element in the remedy of these cases, and we may educate the patient to speak quite distinctly, but, as I have said, the speech will not be perfect; there will be a nasal twang. The muscles that close the nostrils may be brought into use by training. The azygos uvula has the power of projection, and in its efforts to close the cleft, the margins of the muscle will even overlap each other sometimes.

"**Reasons for Failure in Palato-plasty.**—These muscles ordinarily are not used in cleft palate and, if left until adult life, there is atrophy of the muscles owing to lack of use. Now, in order to bring them back into position to close the cleft in the atrophied condition, it requires quite a pull, especially in the anterior half of the cleft. The strong tension under which the muscles are placed militates against the success of the operation. For this reason, operation should be performed in infancy before atrophy of the muscles has occurred. Another very strong reason why the patient should be operated on early in life is to gain an apposition of the parts before any association of speech is formed in the brain. As soon as the child is old enough, it will endeavor to speak whether the cleft is present or not, and if the association of speech has not been properly formed, it is very difficult to rectify it in adult life."

Patients who have been successfully operated upon prior to the speaking age will not have defective speech. Adults and children will oftentimes not be benefited as far as speech is concerned

even though the operation on the palate is a complete success. The science of phonetics has been of inestimable value in teaching these patients how to use their palates. I have often employed an illustration in the final instructions to the adult patient, or to the parent of a child who has recovered from a successful palate operation, which convinces them that both study and practice are essential to correct speech defects. The illustration above mentioned refers to the helplessness of one who receives a gift of a musical instrument, an auto, or an airplane, but who is inexperienced in the management of same. If the recipient of the gift will be diligent in following the instructions of a tutor, practice will sooner or later make him master of the gift. The same is true of one who receives the gift of a palate. He will benefit but little until he has followed the advice of a competent teacher of phonetics.

INDEX

Abscesses, dento-alveolar, 1
acute, 1
chronic, 8
periapical, 8, 203
periodontal, 2
Acromegaly, 20
Actinomycosis, 20
Adenitis, 29
Alcohol, injections of, 159
Alveolar process, fracture of, 139
Alveolectomy, 195
Anesthesia for infants, 281
Ankyloglossia, 82
Ankylosis, 103
bony, 107
Brophy operation for, 107
fibrous, 104
Antrum, accidental punctures of, 235
also see maxillary sinusitis
Apicoectomy, 203
Apiectomy, 203
Atresia palati, 303

Bandage, head, 149
adhesive tape in, 131
Barton's, 150
fourtailed, 149
Gibson's, 151
Bell's Palsy, 172
Bell's Paralysis, 172
"Bleeder," 212
Blind abscess, 202
Bone graft, 133
Brophy's palate operation, 275, 281, 290

Cancer, 58
Cancrum oris, 26
Carcinoma, 58
Cardboard cuffs, use of, 258
Caries, 9
Cellulitis, 29
Cheiloplasty, 179, 250
Cheiloschisis, 244
Chondroma, 54
Cleft lip, 244
etiology of, 246
operations for, 254
reasons for early operations, 251
secondary operations for, 271
time for operations for, 251, 252, 253
treatment after operations for, 270
treatment of, 250
types of operations for, 254
Cleft palate, 275
classification of, 277
defective speech due to, 253, 309
etiology of, 277
Lane's operation for, 296
operations for, 281
operations, speech after, 313
orthodontia for, 280
reasons for early operations, 253
secondary operations on, 297
time for operations, 254, 280
treatment after operations for, 295
treatment for, 277
tripartite, 287
Clefts of soft palate, age for operations, 252
Cold sores, 24
Comedo, 87
Coronoid process, fracture of, 139
Crepitus, 114
Cysts, bone regeneration in, 97
dentigerous, 90
of the antrum, 40
of the jaws, 90
muciparous, 87

Cysts, multilocular, 94
radicular, 90
retention, 84

Defective dentition in cleft palate, 272, 279
Defective speech, 253, 254, 294, 295, 307
correction of, 319
exercise in, 320
final instructions in, 322
training needed in, 318
Double cleft lip, 262
Drainage for dento-alveolar abscess, 3
Dry socket, 233

Edentulous mandibular fractures, 126
Elinguation, 77
Epithelioma, 58
Epulis, 49
Esser's epithelial inlay, 184
Exostosis, 195

Fever blisters, 24
Fibroma, 52
Foot and mouth disease, 27
Fothergill's disease, 154
Fractures, 112
at neck of condyle, 124
delayed union in, 148
irreducible, Silverman's operation for, 124
non union of, 149
of the jaws, 112
of the lingual plate, 232
of the malar bone, 145
of the maxillae, 139
of the zygoma, 146

Gangrene, 9
Glossectomy, 77
Glossodynia, 83
Glossolysis, 82
Graft, bone, 133
skin, 184
Granuloma, 202
Gun shot wounds, 144

Hare lip (see cleft lip)
Hemophilia, 212
Hemorrhage, 210
control of, 213
control of after palate surgery, 295
post-operative, 210
primary, 210
secondary, 210
Hemorrhagic diathesis, 212
Henahan elevator, 232
Herpes labialis, 24
Hyperostosis, 195

Impacted mandibular 3rd molars, removal of, 229
Silverman's incision for, 229
Impacted maxillary cuspids, removal of, 221, 235
Impacted maxillary 3rd molars, removal of, 234
Impacted premolar, orthodontia in, 242
Intermaxillary wiring, 119
Intra-oral incisions, 221
Involucrum, 12
Ionization, 202
Irregularities of the teeth and jaws, 175
orthodontia in, 175
surgery for, 176

Jaws, fracture of (see fractures)
irregularities of, 175
Jaws, resections of, 63
local anesthesia in, 67
partial, 63

Kingsley's splint, 140

Lane's operation for cleft palate, 296
Langenbeck's operation for cleft palate, 291
Lateral incisions, 295
Lead plates, use of in operations, 284, 294, 300
Leontiasis ossea, 19
Leucoma Leucokeratosis, 24
Leukoplakia buccalis, 23
Lingual plate, fracture of, 232

Lipoma, 54
Logan lip traction bow, 258
Ludwig's angina, 28
  proctoclysis in, 29
  Silverman's incision for, 28
Luxation, 101

Macroglossia, 82
Malar bone, fractures of, 145
Malgaigne operation for cleft lip, 254, 255
Mandible, dislocation of, 101
  fractures of, 113
  intermaxillary wiring for fractures of, 118
  protrusion of, 178
  resection of, 68
  retrusion of, 176
  subluxation of, 103
Mandibular nerve, avulsion of, 163
Maxillae, fracture of, 139
  Kingsley's splint in, 140
Maxillary sinusitis, 38
  Caldwell-Luc operation for, 44
  Denker's operation for, 45
Melanosarcoma, 56
Meloplasty, 179
Mumps, 84
Myxoma, 54

Necrosis, 9
  bone, regeneration in, 12
  syphilitic, 17
Needles, removal of broken, 168
Nerve trunk avulsion, 161
Neuralgia, bilateral trigeminal, 156
  facial, 154
  quinti major, 154
  trifacial, 154
  trigeminal, 154
Neurectomy, 161
Noma, 26
Non union of fractures, 149
Nostril plug, uses of, 258

Obturators, 306
Odontoma, composite, 54
Orthodontia, 175
  in cleft palate cases, 280
  in irregularities of teeth and jaws, 175
Osteochondromyxosarcoma, 55, 56
Osteoma, 53
Osteomyelitis, 15
Owen operation for cleft lip, 258

Palate obturators, 306
Paralysis, Bell's, 172
Parotitis, 84
Pericementoma, 202
Periodontoclasia, operation for, 33
Periosteotomes, 290
Periostitis, 15
Perlèche, 24
Pilot sutures, 281, 293
Plastic surgery, 179
Polycyst, 94
Premaxillae, loss of, 272, 280
  operation for, 272
Prosthesis, for cleft palate, 280
  in palate deformities, 306
Prosthesis, maxillo-facial, 187
  use of masks in, 190
Psoriasis linguae, 23
Pyorrhea alveolaris, 33

Ranula, 84
Ray fungus, 20
Refracturing, 126
Rhinoplasty, 179
Root amputation, 203
Root resection, 203

Salivary calculi, 88
Salivary fistula, 89
Sarcoma, 55
  giant-cell, 55
  osteo, 55
  round-cell, 55
  spindle-cell, 55
Scarifier, 286
Scleroma, 27
Scurvy, 27
Sequestrum, 10

Sialolithiasis, 88
Silver wires, in fractures of mandible, 126, 127
 in palate operations, 282, 290, 294, 300
Silverman's incision for Ludwig's angina, 29
 for removal of impacted mandibular third molars, 229
Silverman's injection of the buccinator nerve, 160
Silverman's ligation of the anterior palatine artery, 217
Silverman's operation for condyloid fracture, 125
Soft palate, adhesion of, 303
Speculum, 290
Speech habits, 312
Staphyloplasty, 281
Staphylorrhaphy, 281
Staphyloschisis, 275
Stomaplasty, 179
Stomatitis, 23
 aphthous, 23
 catarrhal, 23
 simple, 23
 ulcerative, 23
 Vincent's, 28
Surgical saw, 67
Surgical shock in infants, 251, 279
Syphilis, 17

Teeth, impacted, 220
 irregularities of, 175
 malposed, 220
 reimplantation of, 208
 transplantation of, 209
 unerupted, 220

Thrush, 23
Tic Douloureux, 154
Tic epileptiforme, 154
Tongue, black, 82
 diseases of, 82
 geographic, 83
 hairy, 82
 injuries of, 83
 malformations of, 82
Tongue, resections of, 77
 Kocher's operation for, 79
 local anesthesia in, 81
 Whitehead's operation for, 78
Tongue-tie, 82
Trench mouth, 28
Trigeminal neuralgia, 154
Trigger zone, 158
Tripartite cleft palate, 287
 method of treating, 288
Trismus, 103
Tuberculosis of the jaws, 18
Tumors, 49, 55
 benign, 49, 54
 malignant, 55, 58

Uraniscoplasty, 281
Uraniscorrhaphy, 281
Uranoschisis, 275
Uranostaphyloschisis, 275
Uvula, operation on, 281, 293

Vincent's stomatitis, 28

Winter-Cryer elevator, 231
Wires, technic for twisting, 303

Zygoma, fractures of, 146